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Focus and contrastive topic in questions and answers, with particular reference to Turkish

<https://doi.org/10.1515/tl-2020-0001>

Abstract: Much recent research has recognized the importance of focus and contrastive topic in assertions for discourse coherence. However, with few exceptions, it has been neglected that focus and contrastive topic also occur in questions, and have a similar role in establishing coherence. We propose a framework of dynamic interpretation based on the notion of Commitment Spaces that show that a uniform interpretation of focus and contrastive topic is possible. The algebraic representation format is rich enough so that a separate introduction of discourse trees is not necessary. The paper discusses these phenomena for Turkish, a language with an explicit focus marker for polar and alternative questions, which distinguishes focus from contrastive topic.

1 Introduction: Focus in answers – and in questions?

The role of focus marking in answers to constituent questions is well-known. The general observation is that the *wh*-constituent corresponds to the focus of the congruent answer (Paul 1880). Intonationally marked focus exponents are capitalized in all examples.

- (1) a. A: *Who played cards?* b. A: *What did Ali play?*
 B: *ALI_F played cards.* B: *Ali played CARDS_F.*

In the familiar framework of Alternative Semantics (Rooth 1992), this relation is captured in the following way: Questions denote sets of propositions, answers

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with focus come with a set of alternative meanings generated by the focus, and the meaning of the question and the alternatives of the answer have to correspond to each other. This is illustrated in (2), where $\llbracket \alpha \rrbracket$ is the regular denotation of α , and $\llbracket \alpha \rrbracket^F$ is the set of alternative denotations; we use φ_{xy} for the proposition “x played y (yesterday)”, a and m to stand for the persons Ali and Merve, c and d to stand for cards and domino, and $\text{ALT}(x)$ for the set of alternatives to x.

$$(2) \quad \begin{array}{ll} \llbracket \text{who played cards?} \rrbracket & \llbracket \text{ALI}_F \text{ played cards.} \rrbracket = \varphi_{ac} \\ = \{\varphi_{xc} \mid x \in \text{PERSON}\} & \llbracket \text{ALI}_F \text{ played cards.} \rrbracket^F = \{\varphi_{xc} \mid x \in \text{ALT}(a)\} \end{array}$$

For question-answer congruence, the regular denotation of the answer must be an element of the question meaning, and the question meaning and the answer alternatives must correspond to each other (we suggest that the latter is a subset of the former, hence $\text{ALT}(a) \subseteq \text{PERSON}$, the set of alternatives of Ali are persons).¹

Polar questions are interpreted in Alternative Semantics, following Hamblin (1973), as sets of propositions, one being the negation of the other. As before, a congruent answer must be an element of the question meaning; focus is not required in this analysis.

$$(3) \quad \begin{array}{ll} \llbracket \text{Did Ali play cards?} \rrbracket & \llbracket (\text{Yes}), \text{ Ali played cards.} \rrbracket \\ = \{\varphi_{ac}, \neg\varphi_{ac}\} & = \varphi_{ac} \end{array}$$

Focus also occurs in questions, e. g. in polar questions as in (4)(a); in (b), focus is made particularly evident by a cleft construction.

- (4) a. *Did ALI_F play cards?*
b. *Was it ALI_F who played cards?*

Assuming that focus creates alternatives, we end up with the following interpretation of focus in polar questions:

$$(5) \quad \begin{array}{ll} \llbracket \text{Did ALI}_F \text{ play cards?} \rrbracket & = \{\varphi_{ac}, \neg\varphi_{ac}\} \\ \llbracket \text{Did ALI}_F \text{ play cards?} \rrbracket^F & = \{\{\varphi_{xc}, \neg\varphi_{xc}\} \mid x \in \text{ALT}(a)\} \end{array}$$

¹ For Rooth (1992), the set of alternatives is the set of all meanings of the type of the item in focus, hence he proposes that the question meaning is a subset of the set of alternative answers.

The resulting focus meaning is a set of sets of propositions. This correctly preserves what is predicted by the ordinary meaning, that the assertions of the propositions ‘Ali played cards’ and ‘Ali didn’t play cards’ are appropriate answers. But it is unclear what the alternatives contributed by focus on *Ali* correspond to. It is also unclear why the answer *Yes, Ali played cards* is complete, whereas the answer *No, Ali didn’t play cards* is felt to be incomplete. In order to model this effect we would have to assume that the focus meaning (5)(b) somehow presupposes that at least one of the alternative polar questions are answered in the positive. But notice that we cannot even determine which of the two propositions is the “positive” one, as propositions are just sets of possible worlds.

Theories of answers to questions also have looked at contrastive topics, as in (6). Contrastive topics (CT), hereafter subscripted by C, are realized by raising accent and optionally also by morphosyntactic markers such as the *as ... for* phrase. They signal that the answer is not complete; here, it is left open what Merve played.

(6) A: *What did Ali and Merve play?*

B: *ALI_C played CARDS_F. / As for ALI_C, he/HE_C played CARDS_F.*

Büring (1997, 2003) and Kadmon (2001) have developed a representation where CT in answers introduces second-order alternatives, resulting in yet another level of interpretation, $[\cdot]^{\text{CT}}$.

- (7) $[\text{As for Ali}_C, \text{he played CARDS}_F] = \varphi_{ac}$
 $[\text{As for Ali}_C, \text{he played CARDS}_F]^F = \{\varphi_{ay} \mid y \in \text{ALT}(c)\}$
 $[\text{As for Ali}_C, \text{he played CARDS}_F]^{\text{CT}} = \{\{\varphi_{xy} \mid y \in \text{ALT}(c)\} \mid x \in \text{ALT}(a)\}$

In this analysis, the CT meaning is a set of sets of propositions like $\{\{\text{‘Ali played cards’}, \text{‘Ali played domino’}, \dots\}, \{\text{‘Merve played cards’}, \text{‘Merve played domino’}, \dots\}, \dots\}$. Büring argues that such meanings are appropriate if the context contains a set of question meanings that correspond to the elements of the CT meaning of the answer, that is, the meaning of constituent questions like *What did Ali play?* and *What did Merve play?*, which can be seen as spelling out the superordinate question *Who played what?* Hence, just as the F meaning of an assertion can be seen as spelling out the immediate question, the CT meaning can be seen as spelling out the superordinate question within a theory of questions under discussion (QUDs) such as Roberts (1996).

Now, we find contrastive topics also in questions, for example in polar questions:

- (8) A: *Did Merve play cards?*
 B: *Yes, she played CARDS_F.*
 A: *And did ALI_C play cards? / And as for ALI_C, did HE_C play cards?*
 B: *No, ALI_C played DOMINO_F.*

Extending this approach to contrastive topics in polar questions, we obtain the following result for the contrastive topic question in the third line:

- (9) $[\text{As for Ali}_C, \text{did he play CARDS}_F?] = \{\varphi_{ac}, \neg\varphi_{ac}\}$
 $[\text{As for Ali}_C, \text{did he play CARDS}_F?]^F = \{\{\varphi_{ay}, \neg\varphi_{ay}\} \mid y \in \text{ALT}(c)\}$
 $[\text{As for Ali}_C, \text{did he play CARDS}_F?]^{\text{CT}} = \{\{\{\varphi_{xy}, \neg\varphi_{xy}\} \mid y \in \text{ALT}(c)\} \mid x \in \text{ALT}(a)\}$

The CT meaning is a set of sets of sets of propositions, here $\{\{\{\varphi_{ac}, \neg\varphi_{ac}\}, \{\varphi_{ad}, \neg\varphi_{ad}\}\}, \{\{\varphi_{mc}, \neg\varphi_{mc}\}, \{\varphi_{md}, \neg\varphi_{md}\}\}, \dots\}$. The elements of this set are polar questions with focus, e.g. *Was it CARDS that Ali played?*, $\{\{\varphi_{ac}, \neg\varphi_{ac}\}, \{\varphi_{ad}, \neg\varphi_{ad}\}\}$. We would expect that these questions are also subordinate to a superordinate question, just as in the CQ case, but now this question is difficult to formulate. Constant (2014) suggests that contrastive topics in such questions suggest sister questions, such as *Was it CARDS that Merve played?* and remarks that this would require a different pragmatics from the interpretation of assertions with contrastive topics (cf. Constant 2014 p. 69 f.). Notice that the proposed meanings for contrastive topics in polar questions in (9) are similar to the meanings of focus in polar questions suggested in (5), which is a problem because their expression and use are different.

Our goal is to develop a theory that is able to explain the similarities and differences of focus and contrastive topic in assertions and in polar questions and other questions (where focus in polar questions has not been discussed prominently so far). The simplest assumption would be that focus and contrastive topic make the same meaning contribution to assertions and questions. Such a theory should assign a function to focus and contrastive topic that is common to both sentence types, and derive any differences from the nature of assertion and polar questions. A theory of this sort is Commitment Space Semantics, as proposed in Krifka (2015).

To show this, we will switch to our main object language, Turkish. This is because Turkish has a dedicated focus marker in polar questions, and a rather clear distinction between focus and contrastive topics in polar questions. In contrast, English lacks a clear and obligatory marker of focus, and the differentiation between focus and contrastive topics in questions is often quite unclear, indeed conflated in the systematically ambiguous *Did ALI play cards?* (cf. Constant 2014). In Section 2, we will present the relevant facts about Turkish.

In Section 3, we will introduce our theoretical framework. In Section 4, we will discuss focus in assertions and polar questions, and Section 5 will be devoted to contrastive topics in assertions and questions. Section 6 proposes an outlook on the nature of F alternatives and CT alternatives, and concludes.

2 Polar questions in Turkish

2.1 Assertions

Turkish is a wh-in-situ, focus-in situ language with SOV base order with optional information structural movement operations. Intonation also marks focus and givenness (Göksel and Özsoy 2000; Kılıçaslan 2004, among others). Thus, there are two ways to indicate a focused subject: in situ with main stress on the subject as in (10)(b), and in a preverbal “focalized” position, again with main stress on the subject (10)(c).

(10)	a.	<i>Ali dün iskambil oyna-dı.</i>
Ali yesterday card play-PAST
'Ali played cards yesterday.'	Broad focus assertion
	b.	<i>ALİ_F dün iskambil oyna-dı.</i>
Ali yesterday card play-PAST
'It was Ali who played cards yesterday'	Subject Focus: in-situ
	c.	<i>Dün iskambil ALİ_F oyna-dı.</i>
yesterday card Ali play-PAST
'It was Ali who played cards yesterday'	Subject Focus: focalized

Wh-expressions share with focused phrases the property of main stress as well as optional focalization. This optional displacement may cause the wh-expression to surface *closer* to the verb. Constituent questions (CQ) in Turkish do not have wh-fronting (cf. Kornfilt 1997).

- (11) a. *KİM dün iskambil oynadı?*
 who yesterday card play-PAST
 'Who played cards yesterday?' Subject CQ: in-situ
 b. *Dün iskambil KİM oynadı?*
 yesterday card who play-PAST
 'Who played cards yesterday?' Subject CQ: focalized

Kılıçaslan (2004) argues based on the availability of the in-situ focus option (10)(b), as well as other evidence, that the displacement observed in (10)(c) is not of the focused phrase but is the leftward evacuation of the topical/backgrounded phrases. Indeed, topics have a strong preference to precede focused phrases whether sentence-initial or not (Kılıçaslan 2004). Notice that the context in (12) evokes contrastive topic readings.

- (12) *Istakozdan ne haber? Onu kim yedi?* (Kılıçaslan 2004)
 ‘How about the lobster? Who ate it?’
 a. *Istakoz-u_T birkaç gün önce ALİ_F ye-di.*
 lobster-ACC several day before Ali eat-PAST
 ‘Ali ate the lobster several days ago.’ Initial topic
 b. *Birkaç gün önce istakoz-u_T ALİ_F ye-di.* Non-initial topic
 c. **^{??} Birkaç gün önce ALİ_F istakoz-u_T ye-di.* Focus before topic

Thus, there is good evidence that Turkish employs leftward movement of topical elements, disrupting the base order more systematically than foci, which may be left in situ. In the remainder of the paper, we will be restricting ourselves to examples in the base order to keep additional variables at bay, but we will refer back to this property when we argue for CT in questions.

2.2 Polar questions and the clitic *-mI*

Polar questions (PQ) are derived with the cliticization of a vowel-harmonic clitic *-mI*, below shown cliticized to the verb, which we also call “final attachment” later.² As we will see in detail in the next section, the clitic is focus-sensitive and the verb is not the only possible host.

- (13) *Ali dün iskambil oyna-dı mı?*
 Ali yesterday card play-PAST MI
 ‘Did Ali play cards yesterday?’ PQ

In modern standard Turkish the polar question clitic is virtually obligatory. Declarative questions marked purely by intonation are very restricted. Rising

² The orthographic convention is to write the clitic separately even though it is part of the vowel harmony domain and may be followed by other bound morphemes. We refer to it throughout as *-mI*, indicating the harmonic vowel in capitals.

declaratives of English, for instance, are rendered with the polar question clitic in Turkish.

- (14) (Asking a colleague who just walked into a windowless office wearing a wet coat)
Hava yağmurlu #(mu)?
 weather rainy MI
 ‘Is it raining?/It’s raining?’

The clitic *-mI* may be found in embedded clauses, interpreted under embedded or matrix scope as in (15). A typical embedded clause is nominalized with its subject bearing genitive case. As the embedded verb cannot host the clitic in this morphosyntactic environment, we exemplify with constituent attachment of *-mI*, anticipating the next section.

- (15) a. *Merve Ali-nin mi iskambil oyna-dığ-in-ı bil-iyor.*
 Merve Ali-GEN MI card play-NOMIN-3SG-ACC know-PRES
 ‘Merve knows whether it was Ali who played cards.’
 b. *Merve Ali-nin mi iskambil oyna-dığ-in-ı san-ıyor?*
 Merve Ali-GEN MI card play-NOMIN-3SG-ACC think-PRES
 ‘Does Merve think that it was Ali who played cards?’

The clitic is also found in alternative questions, with *-mI* occurring on both alternatives. Alternative questions (AltQ) exhibit special intonation and an optional dedicated disjunction. To rule out any ambiguity, we always use this disjunction in our alternative question examples.

- (16) *Ali dün iskambil oyna-dı mı, (yoksa) oyna-ma-dı mı?*
 Ali yesterday card play-PAST MI or play-NEG-PAST MI
 ‘Did Ali play cards yesterday, or not?’ AltQ

The clitic *-mI* is not found in regular constituent questions (17)(a). The only exception is instances questioning the question act itself (17)(b), in which case the clitic attaches to the *wh*-element. Such examples are frequently used rhetorically as a foreshadowing device, or to imply the unexpectedness of a constituent question.

- (17) a. *KİM dün iskambil oyna-dı (*mı)?*
 who yesterday card play-PAST MI
 ‘Who played cards yesterday?’

b. *KĪM mi dün iskambil oyna-dı?*
who MI yesterday card play-PAST
‘Did you ask who played cards yesterday?’
(I didn’t hear./Now you might ask./Are you (really) asking?)’

2.3 Polar questions with Focus

With this background, let us turn to the focal distribution of *-mI* in (18). The clitic attaches to expressions in focus, observing certain locality restrictions we will not be concerned with here. We will be translating such focused polar questions by English clefts to avoid confusion with what we will argue in the next section to be questions with CT.

- (18) a. *ALĪ mi dün iskambil oyna-dı?*
Ali MI yesterday card play-PAST
‘Was it Ali who played cards yesterday?’ Subject focus PQ
- b. *Ali DŪN mü iskambil oyna-dı?*
Ali yesterday MI card play-PAST
‘Was it yesterday that Ali played cards?’ Adverb focus PQ

That the question clitic is related to the focusing of the host constituent is an observation found widely in the literature, e.g. in Ladd (1996), Kornfilt (1997), Göksel and Kerslake (2005), and for good reason. First, focused declaratives and focused polar questions share the intonational hallmark of focus: postfocal deaccentuation (Kamali 2014). Pitch tracks corresponding to the subject focus polar question (18)(a) and subject focus declarative (10)(b), an appropriate answer, in Figure 1 illustrate this low and unaccentable pitch region after the focused subject.

Figure 1: Pitch tracks of *ALĪ mi dün iskambil oynadı* ‘Was it Ali who played cards yesterday?’ (left) and *ALĪ dün iskambil oynadı* ‘It was Ali who played cards yesterday.’ (right).

The pitch track also shows the lack of a final boundary tone on focused polar questions. In combination with postfocal deaccentuation, the region after the focused subject is identical in a polar question and an assertion. The extra high nuclear pitch accent on the question differentiates between the question and the assertion and has been argued to be a marker of the question speech act (Kamali 2014; also see Göksel et al. 2009).

Secondly, polar questions with focus come with an exhaustivity implicature as would be expected of focus (hence our translations by cleft sentences). Accordingly, the *-mI*-marked phrase may appear with the exclusive particle *sadece* ‘only’ (19)(a), in which case the inference is strengthened to entailment. The corresponding Turkish cleft construction delivers the same meaning as the focusing caused by *-mI* (19)(b).

- (19) a. *Sadece ALİ mi dün iskambil oyna-dı?*
 only Ali MI yesterday card play-PAST
 ‘Was it only Ali who played cards yesterday?’
 b. *Dün iskambil oyna-yan ALİ mi?*
 yesterday card play-PRT Ali MI
 ‘Was it Ali who played cards yesterday?’

-Mi-marked phrases and focused phrases also share a number of syntactic properties. One is the possibility of focalization as discussed at the outset. (20) is a possible variant of (18)(a) on a par with the optional focalization observed in declaratives (10).³

- (20) *Dün sinema-ya ALİ mi git-ti?*
 yesterday movies-DAT Ali MI go-PAST
 ‘Is/was it Ali who went to the movies yesterday?’

Another syntactic correlate of focus is the inability of focused constituents to appear after the predicate, a position reserved for backgrounded/given elements and considered a prosodically unaccentable position (Özge and Bozşahin 2010). This observation holds of focused phrases in declaratives (see Erguvanlı-Taylan 1984; Göksel and Özsoy 2000; Kılıçaslan 2004; Özge and Bozşahin 2010 among

³ We change our standard example here because *iskambil* ‘cards’ only has limited movement as it is a pseudo-incorporated object (though such examples have been reported; see Öztürk 2005).

others) and wh-expressions (Göksel and Özsoy 2000) as well as *-mI*-marked phrases in polar questions.⁴ We provide a polar question to exemplify.

- (21) **Dün iskambil oyna-dı ALİ mi?*
 yesterday card play-PAST Ali MI
 ‘Was it Ali who played cards yesterday?’

Alternative Questions provide one of the clearest contexts to observe the nature and scope of focus in focused polar questions. In the case of (18)(a) with subject focus, only subject alternatives provide a viable alternative question, cf. (22)(a). No other constituent can be the alternative, including the negated verb, as was the case with final *-mI* in (16), cf. (22)(b).

- (22) a. *ALİ mi dün iskambil oyna-dı, (yoksa) MERVE mi?*
 Ali MI yesterday card play-PAST or Merve MI
 ‘Was it Ali who played cards yesterday, or Merve?’
 b. **ALİ mi dün iskambil oyna-dı, (yoksa) CUMA mı/*
 Ali MI yesterday card play-PAST or Friday MI
oyna-ma-dı mı?
 play-NEG-PAST MI
 ‘*Was it Ali who played cards yesterday, or Friday/or not?’

Let us briefly turn to what happens if the verb is the morphological host of *-mI*, exemplified at the outset in (13). This situation will arise when no phrase is focused, or a component in the verbal morphological complex is focused. In the latter case, the clitic may associate with verb focus and tense focus, exemplified with alternative questions in (23). We will not be concerned here with such cases of focus within the verbal complex.

- (23) a. *Ali pizza-yı ye-di mi, (yoksa) at-ti mi?*
 Ali pizza-ACC eat-PAST MI or throw.away-PAST MI
 ‘Did Ali eat the pizza, or throw it away?’ Verb focus
 b. *Ali pizza-yı ye-di mi, (yoksa) yi-yecek mi?*
 Ali pizza-ACC eat-PAST MI or eat-FUT MI
 ‘Did Ali (already) eat the pizza or will he (do it later)?’ Tense focus

⁴ Note that in the cleft example in (19)(b), the same focused agent is the predicate, thus not a counterexample to this.

Other than these restricted uses of verb and tense focus, final placement of the clitic corresponds to a characteristic kind of polarity focus. This reading of polarity focus was exemplified in (16) with an alternative question, and is expected if one assumes that the verbal complex includes a (phonologically null) polarity marker.

In contrast, final attachment is incompatible with clausal alternatives. If one wants to focus on the TP or the VP, the clitic is attached to the pre-verbal argument and projects focus from there (b), cf. Kamali (2015).

- (24) a. **Ali iskambil oynadı mı,*
 Ali card play-PAST MI
 (yoksa) *Merve sinema-ya git-ti mi?*
 or Merve movies-DAT go-PAST MI
 ‘Did Ali play cards, or Merve go to the movies?’
 b. **Ali iskambil mi oynadı, (yoksa) Merve sinema-ya mi git-ti?*
 Ali card MI play-PAST or Merve movies-DAT MI go-PAST
 ‘Did Ali play cards, or Merve go to the movies?’

We leave a detailed investigation of the focus projection exemplified in (24)(b) to future work. For now, we will interpret verbal attachment with polar alternatives as in (24)(a) as involving focus on polarity, as will be taken up in Section 4.2.

This concludes our introduction to the regular, focused polar question in Turkish. The clitic *-mI* is attached to the focused element or an exponent thereof. The *-mI*-marked phrase has an extra high pitch accent followed by postfocal deaccentuation but there is no final rise. The host phrase determines possible focus alternatives, including polarity, most clearly visible in alternative questions. All regular polar questions with *-mI* are thus focused. We will hence be calling them focused polar questions (FPQs) and devote Section 4 to a detailed semantic account of the focused polar question as opposed to focused assertions, touching upon other relevant constructions such as alternative questions and constituent questions as we proceed.

2.4 Contrastive topic in polar questions

There is a rarely addressed counterpart to focused polar questions with a similar focal accent but without *-mI* on the accented element (Göksel and Kerslake 2005; Sato 2009). Kamali and Büring (2011) and Kamali (2015) make the case that these polar questions involve contrastive topics. We will be building on and extending their observations.

In polar questions with contrastive topic (CTPQ), the sole accent of the utterance appears on a phrase in contrast, such as the subject in our examples, while the clitic *-mi* is on the verb. Thus, in contrast to the subject focus polar question in (18)(a) with accent and clitic on the subject, the corresponding polar question with contrastive topic has the accent on the subject, but the clitic on the verb. This gives us our main contrast:

- (25) a. *ALİ mi dün iskambil oynadı?*
Ali MI yesterday card play-PAST
‘Was it Ali who played cards yesterday?’ FPQ; (18)(a)
- b. *ALİ dün iskambil oynadı mı?*
Ali yesterday card play-PAST MI
‘How about Ali? Did HE play cards yesterday?’ CTPQ

The two kinds of polar questions differ in intonation in addition to the placement of the clitic. While the FPQ does not end in a boundary rise, the CTPQ does.⁵ Other aspects of the intonation appear to be identical, i. e. height and shape of the nuclear accent and subsequent postfocal deaccentuation.

Figure 2: Pitch tracks of *Ali mi dün iskambil oynadı* ‘Was it Ali who played cards yesterday’ (left, same as in Figure 1) and *ALİ dün iskambil oynadı mı* ‘How about Ali? Did HE play cards yesterday?’ (right).

How do we arrive at a characterization of the accented element in such polar questions as (25)(b) as contrastive topic? We can show pretty clearly that the accented noun phrase in these examples fails tests indicating focus and instead

⁵ That this pitch movement is a boundary rise is evident from a number of observations. First, it does not appear on focused polar questions with verb attachment as in (16). Second, in a CTPQ, the rise appears after postverbal elements if there is any. Lastly, *-mi* is a prestressing affix. It is associated with a pitch rise prior, not after.

unambiguously corresponds to a CT reading. First and foremost, the accented element in these polar questions does not host *-mİ*, which, as we saw in Section 2.3, attaches to the focused constituent. On the other hand, if an example like (25)(b) only had focus on the verb or polarity, the accented subject would not correspond to alternatives, contrary to intuition.

Instead of focus, the highlighted constituent in (25)(b) has a topical flavor. It is naturally preceded by topic-shifting expressions such as *peki* and *ya*, roughly corresponding to *as for* and *how about* in English, hence our translations.

- (26) *Peki ya Ali? O/ALİ iskambil oyna-dı mı?*
 as.for how.about Ali he/Ali card play-PAST MI
 ‘As for Ali, did HE/ALİ play cards?’

Secondly, there are no exhaustivity inferences associated with the accented element expected of focus. Therefore, a cleft is not an appropriate paraphrase, and the accented phrase cannot have the exclusive particle in the CTPQ configuration.

- (27) *??Sadece ALİ iskambil oyna-dı mı?*
 Only Ali card play-PAST MI
 ‘As for Ali, did only HE/ALİ (also) play cards?’

In line with its lack of exhaustivity inferences, the CTPQ configuration does not allow alternative questions, cf. (28).

- (28) a. *ALİ mi dün iskambil oyna-dı,*
 Ali MI yesterday card play-PAST
 (yoksa) *EMRE mi (oyna-dı)?*
 or Merve MI play-PAST FPQ AltQ
 ‘Was it Ali who played cards yesterday, or Merve?’
 b. **ALİ dün iskambil oyna-dı mı,*
 Ali yesterday card play-PAST MI
 (yoksa) *EMRE (oynadı) mı?*
 or Merve play-NEG-PAST MI CTPQ AltQ

In fact, the CTPQ systematically causes inferences of anti-exhaustivity. CTPQs are incompatible with the exclusive particle or the alternative question configuration because they lead to contradictory readings like ‘Was only Ali among the card players?’ and ‘Was it Ali or Merve who was among the many card players?’

Let us examine this difference in exhaustivity between the two polar question forms with respect to predicates with and without an exclusive lexical semantics. We see that polar questions that ask for an exclusive answer must be realized with the FPQ, as in (29)(a) and (30)(a). CTPQs in (29)(b) and (30)(b) are infelicitous as they imply multiple scorers of the most goals in one championship and multiple grooms getting married to one woman at one wedding.⁶

- (29) a. *Bu kupa-da en çok gol-ü MESSİ mi at-tı?*
 this cup-LOC most many goal-ACC Messi MI score-PAST
 ‘Was it Messi who scored the most goals in this World Cup?’
 b. *#Bu kupada en çok golü MESSİ attı mı?*
- (30) a. *Melis’le bu akşam ERKAN mı evlen-iyor?*
 Melis-COMM this evening Erkan MI wed-PRES
 ‘Is it Erkan who is marrying Melis tonight?’
 b. *#Melis’le bu akşam ERKAN evleniyor mu?*

Conversely, the CTPQ form is required when the predicate at hand is explicitly non-exhaustive. The FPQs in (31)(b) and (32)(b) fail in this case because they imply a single goal-scorer for the whole championship, and a single card-player playing on his own.

- (31) (Talking about a World Cup, where typically some 150 goals are scored.)
 a. *ÖZİL gol at-tı mı?*
 Özil goal score-PAST MI
 ‘As for Özil, did HE score a goal?’
 b. *#ÖZİL mi gol attı?*
- (32) (My friends stayed up after I went to bed and some played cards.)
 a. *ALİ iskambil oyna-dı mı?*
 Ali cards play-PAST MI
 ‘As for Ali, did HE play cards?’
 b. *#ALİ mi iskambil oyna-dı?*

These anti-exhaustivity effects, we believe, are due to the fact that CTPQs indicate the presence of other sister questions, like *Did Messi score a goal?*, *Did Müller score a goal?* etc., which precludes an exhaustive interpretation. Discourse Trees models such as Roberts (1996) and Büring (2003) have a

⁶ Examples due to Kamali & Büring (2011).

mechanism to represent this. Our proposal will be similar, cf. Section 5.3. Differently from these works, however, we argue that these questions have a contrastive topic, and that focus in questions is also possible in a second, distinct configuration. Section 5 is devoted to contrastive topics in assertions and questions.

2.5 Contrastive topic in constituent questions

Just like English, Turkish has constituent questions where an accented element other than the *wh*-phrase is present. Like in polar questions, these elements carry the sole pitch accent of the utterance, making them look at first sight like foci in both languages.

- (33) *ALİ ne oyna-dı?*
 Ali what play-PAST
 ‘What did ALİ play?’

On closer inspection, however, CT characteristics emerge. These elements are felicitously introduced by topic shift markers like *peki/how about* in both languages.

- (34) *Peki Ali? O/ALİ ne oyna-dı?*
 then Ali he/Ali what play-PAST
 ‘How about Ali? What did HE/ALİ play?’

More strikingly, in Turkish, the accented non-*wh*-element is preferably fronted across the *wh*-element. In (35)(a) we see the CT object in this fronted position; the non-moved ordering in (b) is dispreferred even though the object is pseudo-incorporated, which typically limits the movement of these elements (see Öztürk 2005).⁷ This leftward movement is entirely unexpected if the object is the focus. As discussed in Section 2.1, foci surface closer to the verb; it is topics that are preferably fronted.

- (35) a. *İSKAMBİL kim oyna-dı?*
 card who play-PAST
 ‘Who played CARDS?’

⁷ It is not possible to observe a similar CT fronting in CTPQs, presumably because the CT > Focus ordering is already satisfied by virtue of the CT preceding the *-mI*-marked verb, preempting a need for movement.

- b. ??*Kim İSKAMBİL oyna-dı?*
 who card play-PAST

Notice further that, as shown in (36), the preferred derived order poses an intervention configuration, whereas the dispreferred order is intervention-free. If the accented object were focused, we would see reverse acceptability due to intervention (cf. Beck 2006).

- (36) a. ??*Sadece İSKAMBİL kim oyna-dı?*
 only card who play-PAST
 b. *Kim sadece İSKAMBİL oyna-dı?*
 who only card play-PAST
 ‘Who played only CARDS?’

In addition to their felicity in topic-related contexts such as topic shift, facts from constituent order, in particular the apparent presence of topicalization, lead us to the conclusion that accented noun phrases in constituent questions in Turkish are contrastive topics. Due to their similar properties, we expect that the same holds in English constituent questions with an accented phrase other than the *wh*-phrase such as *What did ALİ play?* We develop an account of such cases of contrastive topics in constituent questions in Sections 4.6 and 5.4.

In this section we have laid out the empirical paradigm in Turkish polar questions that the rest of the paper will analyze formally. The main contrast we presented is between polar questions with focus, recognized widely for Turkish, and polar questions with contrastive topic. We have also discussed information structure, alternative questions, and constituent questions in Turkish and used one information structural property, namely topicalization, to support our argument that constituent questions with an accented noun phrase are questions with CT, similar to polar questions with CT.

Notice that what we analyze as contrastive topic in polar and constituent questions is a prosodically unlikely contrastive topic. Namely, the contrastive element is the sole accent bearer of the utterance, patterning with foci in assertions and not with CTs in assertions (cf. Figure 2). This pattern is also found in more widely studied languages like English and German, which has led to the assumption that they are foci (for instance, in Buring 2003); that is, *Ali* is focused (and can only be focused) in *Did ALİ play cards?*

We do not know why these unrelated languages may suppress the marking of a second accent, in effect the marking of CT, in questions, but we believe that

the prosodic mapping of questions and assertions do not *a priori* have to be identical. We refer the reader to Constant (2014), who also argues for contrastive topics in questions and discusses several options to explain this “under-extension of the CT contour”.

This unresolved mystery with CT intonation aside, the placement of the clitic *-mI* in Turkish distinguishes between focused polar questions and polar questions with contrastive topic, which we take up in Sections 4.2 and 5.3, respectively. Alternative questions are by definition focused (see Section 4.4). Apparent topicalization in constituent questions indicates that accented phrases other than the *wh*-expression in constituent questions are contrastive topics (see Section 5.4).

3 The theoretical framework: Commitment Spaces

In the present section, we will introduce the basic assumptions of the framework of Commitment Space Semantics, and show how it treats assertions and polar questions. The treatment here will be concise, concentrating on features that are essential for the modeling of focus and contrastive topic.

The central notion in Krifka (2015) is the commitment state. This is a set of propositions c , the propositions that the participants of a conversation mutually consider as shared. A simple move in a conversational game is that a speaker adds a proposition φ to c , resulting in the set $c \cup \{\varphi\}$. We say that the input commitment state c is updated with the proposition φ , yielding the output commitment state $c \cup \{\varphi\}$. Commitment states are supposed to be non-contradictory; that is, $c \cup \{\varphi\}$ is not a proper commitment state if φ is logically incompatible with the propositions in c .

The notion of commitment state is extended to the notion of commitment space (CS, for short). A commitment space C represents the propositions that the participants of a conversation assume to be shared, together with all the acceptable continuations.⁸ If a commitment state c represents the shared information at the current point, the continuations of c will be commitment states c' , that

⁸ This is related to the notion of “Kontextraum” (context space) in Reich (2003: 83), except that Reich assumes that such context spaces are created only in case a question is asked. It is even more closely related to the notion of context in Inquisitive Semantics (cf. Ciardelli et al. 2019) which allows for updates by assertions or questions; one crucial difference is that for Inquisitive Semantics, a question crucially creates a choice of at least two options, whereas the current framework also allows for non-disjunctive, “monopolar” questions. For other uses of commitment spaces cf. also Cohen and Krifka (2014).

contain more information – that is, for which it holds that $c \subset c'$. Technically, CSs are modeled as sets of commitment states; the set of non-empty smallest commitment states in a commitment space C , $\{c \in C \mid c \neq \emptyset \wedge \neg \exists c' \in C [c' \subset c]\}$, is called the “root” of C , written $\sqrt{C}$. If this is a singleton set, i. e. $\sqrt{C} = nC$, the element nC in this set represents the information agreed upon at the current point in conversation.⁹

A commitment space C can be updated by a proposition φ by updating all the commitment states c in C with φ . We will write $\cdot\varphi$ for the assertive update of a CS by φ :¹⁰

$$(37) \text{ Assertive update function: } \cdot\varphi = \lambda C \{c \in C \mid \varphi \in c\}$$

We typically will write $C + \varphi$ instead of $\varphi(C)$. To illustrate things with a concrete example, consider the update of a CS C_0 with an assertion of the proposition ‘Ali played cards’.

$$(38) \quad C_0 + [\text{Ali played cards.}] = C_0 + \cdot\varphi_{ac} = \cdot\varphi_{ac}(C_0) = \lambda C \{c \in C \mid \varphi_{ac} \in c\}(C_0) \\ = \{c \in C_0 \mid \varphi_{ac} \in c\}$$

Updates in general can undergo a number of operations, in particular, dynamic conjunction as in (39)(a), Boolean conjunction (b), disjunction (c) and negation (d), called “denegation”. Gothic letters are used for updates, $\lambda C[\dots]$.

$$(39) \quad \begin{array}{lll} \text{a. } C + \mathfrak{A} ; \mathfrak{B} & = [C + \mathfrak{A}] + \mathfrak{B} & \text{dynamic conjunction} \\ \text{b. } C + [\mathfrak{A} \ \& \ \mathfrak{B}] & = [C + \mathfrak{A}] \cap [C + \mathfrak{B}] & \text{Boolean conjunction} \\ \text{c. } C + [\mathfrak{A} \ \vee \ \mathfrak{B}] & = [C + \mathfrak{A}] \cup [C + \mathfrak{B}] & \text{disjunction} \\ \text{d. } C + \sim \mathfrak{A} & = C - [C + \mathfrak{A}] & \text{denegation} \end{array}$$

Dynamic conjunction is the functional composition of two speech acts, or their execution in sequence, for example $C_0 + [\cdot\varphi ; \cdot\psi] = [C_0 + \cdot\varphi] + \cdot\psi = \{c \in \{c \in C_0 \mid \varphi \in c\} \mid \psi \in c\}$, which reduces to $\{c \in C_0 \mid \varphi \in c \wedge \psi \in c\}$. Boolean conjunction is the intersection of the CSs that results when the input CS is updated with the conjunct speech act, for example $C_0 + [\cdot\varphi \ \& \ \cdot\psi] = \{c \in C_0 \mid \varphi \in c\} \cap \{c \in C_0 \mid \psi \in c\} = \{c \in C_0 \mid \varphi \in c \wedge \psi \in c\}$. It leads to the same result as dynamic conjunction, but this is different in a model for anaphoric binding, as no binding between the two propositions would be allowed. Disjunction is the union of the two CSs

⁹ In Krifka (2015), the root of a commitment space is defined as this unique element itself.

¹⁰ In Krifka (2015), assertive update actually involves adding the proposition that the speaker is publicly committed the truth of the asserted proposition. To keep the exposition simple, this feature – which is the motivation for the term *commitment space* – is suppressed here.

resulting from the update of the disjuncts; for example: $C_0 + [\cdot\varphi \vee \cdot\psi] = \{c \in C_0 \mid \varphi \in c\} \cup \{c \in C_0 \mid \psi \in c\} = \{c \in C_0 \mid \varphi \in c \vee \psi \in c\}$. Denegation amounts to the removal of commitment states that satisfy a certain condition. For example, $C_0 + \sim \cdot\varphi = C_0 - \{c \in C_0 \mid \varphi \in c\} = \{c \in C_0 \mid \varphi \notin c\}$. Denegation of speech acts is used to model the refraining from performing a speech act, such as *I don't promise to come* or *I don't say that it bothered me*.

In order to model communication with CSs, we have to keep track of the stages along which a conversation develops. One reason for this is that one participant may reject a proposal of another, thus preventing it to become part of the common ground, the joint CS. This can be dealt with using a setup that has a specific negotiation area, such as the “table” in Farkas and Bruce (2010). Here we assume an operation that retracts recent moves in the conversation, cf. Krifka (2015). This is implemented by representing conversations as commitment space developments, that is, sequences of CSs. In a regular update, the last CS of a sequence is updated by a speech act, and the result (here in boldface) is appended to the sequence, thus becoming the new CS for the next conversational move.

$$(40) \langle \dots, C_{n-2}, C_{n-1}, C_n \rangle + \mathfrak{A} = \langle \dots, C_{n-2}, C_{n-1}, C_n, \mathbf{C_n} + \mathfrak{A} \rangle$$

For example, adding the assertion that Ali played cards to a CS sequence has the following result:

$$(41) \langle \dots, C_{n-1}, C_n \rangle + \llbracket \text{Ali played cards.} \rrbracket = \langle \dots, C_{n-1}, C_n, \mathbf{C_n} + \cdot\varphi_{ac} \rangle$$

Retraction is necessary in case the addressee does not go along with this proposed update and rejects it, e. g. by *no*, or *I don't believe that*. This operation $\mathfrak{R}$ works as follows:

$$(42) \langle \dots, C_{n-2}, C_{n-1}, C_n \rangle + \mathfrak{R} = \langle \dots, C_{n-2}, C_{n-1}, C_n, \mathbf{C_{n-1}} \rangle$$

That is, the next-to-last CS is copied to the end of the list, making it current again. This retraction operation is required if a conflicting speech act is uttered, as otherwise the CS would contain contradictory propositions:

$$(43) (41) + \mathfrak{R} + \llbracket \text{No, he didn't (play cards).} \rrbracket \\ = \langle \dots, C_{n-1}, C_n, C_n + \cdot\varphi_{ac}, C_n, \mathbf{C_n} + \cdot\neg\varphi_{ac} \rangle$$

We now turn to questions. Questions can be expressed as proposals that do not add information to a CS, that is, that do not increase the information in the root.

Rather, they restrict the continuations from the root. For example, to ask whether Ali played cards or not leaves the root intact but restricts the updates in such a way that either φ_{ac} or $\neg\varphi_{ac}$ can be added. The basic operation is interrogative update, defined as follows:

$$(44) \text{ Interrogative update function: } ?\varphi = \lambda C[\sqrt{C} \cup C + \cdot\varphi] = \lambda C[\sqrt{C} \cup \{c \in C \mid \varphi \in c\}]$$

Interrogative update $?\varphi$ is like assertive update $\cdot\varphi$ except for leaving the root of the input CS intact. For example, the question *Did Ali play cards?* would restrict the continuations of the input CS to those for which it holds that Ali played cards:

$$(45) C_0 + \llbracket \text{Did Ali play cards?} \rrbracket = C_0 + ?\varphi_{ac} = \sqrt{C_0} \cup \{c \in C_0 \mid \varphi_{ac} \in c\}$$

Notice that this restricts the future continuations towards just one answer, the non-negated proposition.¹¹ Such polar questions are “monopolar”. A positive answer to a monopolar question is straightforward. Following Krifka (2013), we can assume that *yes* picks up the proposition introduced as a propositional discourse referent by the question and updates the CS with that proposition:

$$(46) \langle \dots, C_n \rangle + \llbracket \text{Did Ali play cards?} \rrbracket = \langle \dots, C_n, [\sqrt{C_n} \cup \{c \in C_n \mid \varphi_{ac} \in c\}] \rangle$$

$$(47) (46) + \llbracket \text{Yes, he did.} \rrbracket = (46) + \cdot\varphi_{ac} \\ = \langle \dots, C_n, [\sqrt{C_n} \cup \{c \in C_n \mid \varphi_{ac} \in c\}], \{c \in C_n \mid \varphi_{ac} \in c\} \rangle$$

A negative answer also picks up that propositional discourse referent and updates the CS with the negation of that proposition. But now the last move has to be retracted first, involving $\Re$, otherwise the resulting CS would be inconsistent.

$$(48) + R + \llbracket \text{No, he didn't.} \rrbracket = (46) + \Re + \cdot\neg\varphi_{ac} \\ = \langle \dots, C_n, [\sqrt{C_n} \cup \{c \in C_n \mid \varphi_{ac} \in c\}], C_n, \{c \in C_n \mid \neg\varphi_{ac} \in c\} \rangle$$

This might appear similar to contradicting the first speaker, as in (43). However, notice that with a negative response to an assertion, the retraction of a previous claim by the other speaker is a rejection of this claim, whereas a negative

¹¹ The possibility of such polar questions with just one answer has been assumed before, cf. Roberts (1996), Büring (2003: 532), Biezma and Rawlins (2012), Constant (2014: 41).

response to a monopolar question only retracts a proposed continuation. In the more elaborate framework of Krifka (2015), this difference is modeled explicitly: In assertions, the speaker adds a public commitment to the truth of a proposition, whereas with questions, the speaker checks whether the addressee would commit to a proposition (cf. fn. 10).

It is also possible to perform an interrogative update by disjunction of interrogative updates, as in (49), resulting in a “bipolar” question. In this case neither the affirming nor the negating answer would require retraction. We exemplify with a polarity alternative question as this is the most unambiguous case of a bipolar question, but this meaning is in principle available more broadly.

$$\begin{aligned}
 (49) \quad C_0 + \llbracket \text{Did Ali play cards or not?} \rrbracket &= \\
 C_0 + [?\varphi \vee ?\neg\varphi] &= [\sqrt{C_0} \cup \{c \in C_0 \mid \varphi_{ac} \in c\}] \cup [\sqrt{C_0} \cup \{c \in C \mid \neg\varphi_{ac} \in c\}] \\
 &= \sqrt{C_0} \cup \{c \in C_0 \mid \varphi_{ac} \in c\} \cup \{c \in C_0 \mid \neg\varphi_{ac} \in c\} \\
 &= \sqrt{C_0} \cup \{c \in C \mid \varphi_{ac} \in c \vee \neg\varphi_{ac} \in c\}
 \end{aligned}$$

With the assumptions and formalisms of Commitment Space Semantics in place, we are ready to tackle the empirical paradigm of focus and contrastive topic in Turkish polar questions.

4 Focus in assertions and in polar questions

In this section, we develop a proposal for the role of focus in assertions and in questions. We argue that there is one common function of focus that is present both in assertions and in polar questions, namely a requirement on the current state of conversation that can be uniformly modeled as a disjunction of alternatives of the assertion or polar question.

More specifically, in Section 4.1 we lay the ground for the following sections by proposing a syntactic representation and semantic interpretation that distinguishes between propositions and speech acts, and show how focus in assertions is evaluated at the level of speech acts. In Section 4.2, we turn to focus in polar questions and show that the same rule of focus interpretation is at work in this case as well. In Section 4.3, we discuss exhaustivity effects on focus marking, and in Section 4.4, we treat alternative questions as disjunctions of questions. In Section 4.5, we have a closer look at constituent questions and their analysis as disjunction of polar questions, and in 4.6 we discuss the compositional derivation of focus structures.

4.1 Assertions and Focus in Assertions

We will first propose a specific syntactic structure that distinguishes between a proposition and the assertion of this proposition. This corresponds to the distinction Frege (1918) drew between “Gedanke” (thought, proposition) and “Behauptung” (assertion) of a proposition. We assume that propositions and assertions are also distinct syntactic phrases, namely Tense Phrase (TP) and Act Phrase (ActP), the latter corresponding to some extent to the category Force Phrase of Rizzi (1997).

A TP can occur as a complement to a propositional attitude predicate like *san* ‘think’ as in (50)(a), or as complement to an Act⁰ head that transforms it into an ActP in assertions, represented by the dot operator in (50)(b) for assertions. This operator is covert in Turkish; the morphological form of the embedded verb in (a) and the root verb in (b) are identical.¹² In other languages it may be expressed by overt morphology, such as sentence-final declarative particles in Korean (Pak 2008), or by syntactic movement, such as verb second in German (Truckenbrodt 2006). In Turkish, the identity between the root declarative and the embedded clause under a propositional attitude expression indicates that it is expressed by a null morpheme.

- (50) a. *Merve* [_{VP} [_{TP} *Ali iskambil oynadı*] [_{V°} *san-ıyor*]].¹³
 Merve Ali card played think-PRES
 ‘Merve thinks Ali played cards.’
 b. [_{ActP} [_{TP} *Ali iskambil oynadı*] [_{Act°} ·]]
 ‘Ali played cards.’

Assertive Act Phrases express assertive updates by their propositional arguments:

$$(51) \quad \llbracket [\text{Act}^0 \cdot] \rrbracket = \lambda p \lambda C \{c \in C \mid p \in c\} = \lambda p [\cdot p]$$

The derivation of the meaning of the ActP in (50)(b) is given in (52), where φ_{ac} stands for the proposition *Ali played cards*.

¹² Note that other embedding strategies also exist in Turkish that add nominal morphology to the embedded clause, which is tangential to the observation made here.

¹³ We bracket syntactic heads as a visual aid to avoid confusion when we use the small symbols · and ? as heads.

$$\begin{aligned}
 (52) \quad & \llbracket_{[\text{ActP} \text{ } [_{\text{TP}} \text{ Ali } \text{iskambil oynadı}] \text{ } [_{\text{Act}^\circ} \cdot]]} \rrbracket \\
 &= \llbracket_{[\text{Act}^\circ \cdot]} \rrbracket (\llbracket_{[\text{TP} \text{ Ali } \text{iskambil oynadı}]} \rrbracket) \\
 &= \lambda p \lambda C \{C \in C \mid p \in C\}(\varphi_{ac}) \\
 &= \lambda C \{C \in C \mid \varphi_{ac} \in C\} \\
 &= \cdot \varphi_{ac}
 \end{aligned}$$

The Act Head $[_{\text{Act}^\circ} \cdot]$ is an illocutionary operator, as assumed in theories linking truth-conditional semantics to speech acts in the tradition of Stenius (1967), Searle (1969) and Searle and Vanderveken (1985). In the current framework, it takes a proposition and delivers an assertive CS update. Notice that CS updates are semantic objects, functions from CSs (sets of sets of propositions) to CSs.

We now turn to the contribution of focus. We follow the general theory that focus indicates alternatives (cf. Rooth 1992), assuming that the alternatives can be interpreted at the speech act level and indicate alternative speech acts that are relevant for interpretation at the current point in discourse. As representation framework for focus, we switch to Structured Meanings (cf. von Stechow 1990; Krifka 2011) as it will allow for a versatile notation system for later discussion. We represent a proposition with focus as a triple of a background meaning, a focus meaning, and a set of alternatives to the focus, $\langle B, F, A \rangle$. The background is a function that can be applied to the focus, $B(F)$, leading to a standard meaning. The set of alternatives to the focus generates a set of alternative meanings $\{B(x) \mid x \in A\}$. This is illustrated in (53) for a focused TP:

$$\begin{aligned}
 (53) \quad & \llbracket_{[\text{TP} \text{ Ali}_F \text{iskambil oynadı}]} \rrbracket = \langle \lambda x[\varphi_{xc}], a, \{a, m\} \rangle \\
 & \text{Normal meaning:} \quad \lambda x[\varphi_{xc}](a) = \varphi_{ac} \\
 & \text{Alternative meaning:} \quad \{\lambda x[\varphi_{xc}](x) \mid x \in \{a, m\}\} = \{\varphi_{ac}, \varphi_{mc}\}
 \end{aligned}$$

The focus-background structure will be preserved in the level of the ActP, yielding the interpretation (54), where the background is a function from entities x into assertive updates.

$$(54) \quad \llbracket_{[\text{ActP} \text{ } [_{\text{TP}} \text{ Ali}_F \text{iskambil oynadı}] \text{ } [_{\text{Act}^\circ} \cdot]]} \rrbracket = \langle \lambda x \lambda C [C + \cdot \varphi_{xc}], a, \{a, m\} \rangle$$

Focus in an assertion indicates congruence with an explicit or implicit question. In the current framework, focus is modeled as a restriction on the input commitment space C . In particular, C must be such that it is asked for which of the alternatives x of Ali does it hold that x played cards. This means that C must allow only for those continuations that result in the update of a proposition φ_{xc} , where $x \in \{a, m\}$. This restriction is generated by the constituent question *Kim iskambil oynadı?* ‘Who played cards?’. If Ali and Merve are the only persons

under consideration, (55) is the CS after asking this question (see Section 4.5 for the modeling of constituent questions). This restriction can also be accommodated. In (55), we make use of the notation $\bigcup_{x \in A} B_x$ for $\bigcup \{B_x \mid x \in A\}$, that is, for the union of all the sets B_x with $x \in A$.

$$\begin{aligned} (55) \quad C' &= \sqrt{C} \cup \bigcup_{x \in \{a, m\}} C + \cdot \varphi_{xc} \\ &= \sqrt{C} \cup C + \cdot \varphi_{ac} \cup C + \cdot \varphi_{mc} \\ &= \sqrt{C} \cup \{c \in C \mid \varphi_{ac} \in C \vee \varphi_{mc} \in C\} \end{aligned}$$

In case the condition is justified, the input CS is assertively updated by $\cdot \varphi_{ac}$:

$$(56) \quad C + \llbracket ALI_F \text{ iskambil oynadı.} \rrbracket = C + \cdot \varphi_{xc},$$

provided that $C = \sqrt{C} \cup \{c \in C \mid \varphi_{ac} \in C \vee \varphi_{mc} \in C\}$

We now derive from these considerations a general rule for the update of an input commitment space C with a structured CS update tuple $\langle B, F, A \rangle$. For this we introduce a piece of notation: In a lambda-term of the form $\lambda X \frac{D(X)}{V(X)}$ the part $D(X)$ represents the domain restriction of the function, effectively the presupposition that has to be satisfied for arguments X , and $V(X)$ represents the value of the function when applied to X . The interpretation of a speech act with a background-focus-alternatives structure now can be rendered as in (57), where FS is an operator that takes a focused speech act and changes it into an update function.

$$(57) \quad FS(\langle B, F, A \rangle) = \lambda C \frac{C = \sqrt{C} \cup \bigcup_{x \in A} B(x)(C)}{B(F)(C)}$$

This function takes an input commitment space C as argument, provided that it has the property, as expressed on the upper line, that it only allows for continuations by alternatives $B(x)$, $x \in A$. For other CSs, the update function is not defined; this may trigger the accommodation of an appropriate CS. In case the requirement on the input C is satisfied, C is changed by the speech act $B(F)$, as expressed on the lower line. For example for (55) we get the following interpretation:

$$\begin{aligned} (58) \quad FS(54) &= \lambda C \frac{C = \sqrt{C} \cup \bigcup_{x \in \{a, m\}} C + \cdot \varphi_{xc}}{C + \cdot \varphi_{ac}} \\ &= \lambda C \frac{C = \sqrt{C} \cup C + \cdot \varphi_{ac} \cup C + \cdot \varphi_{mc}}{C + \cdot \varphi_{ac}} \end{aligned}$$

The upper line states that the input C only has continuations that add the proposition φ_{ac} or φ_{mc} . If this condition is satisfied, the output adds the proposition φ_{ac} to C . For example, asking who of Ali and Merve played cards will result in a CS at which the requirements of (58) are satisfied, and the assertion itself will reduce the CS in such a way that it is established that Ali played cards:

$$(59) \quad [\sqrt{C_0} \cup C_0 + \cdot\varphi_{ac} \cup C_0 + \cdot\varphi_{mc}] + (58) = C_0 + \cdot\varphi_{ac}$$

How is the FS operator realized in grammar? Three options come to mind. We may assume that the FS operator can be freely applied whenever required, similar to type-shifting or coercing operators that, for example, change a nominal expression to a referring expression in the absence of definite articles (cf. Partee 1987; Chierchia 1998). Alternatively, we may assume a focus-sensitive assertion operator by composition of FS with $[_{Act^\circ} \cdot]$, resulting in the focused assertion operator (60) that expects a structured proposition as an argument. Such focus-sensitive illocutionary operators have been proposed by Jacobs (1984).

$$(60) \quad \llbracket [_{Act^\circ} FS \cdot] \rrbracket((B, F, A)) = FS(\llbracket [_{Act^\circ} \cdot] \rrbracket((B, F, A))) = \lambda C \frac{C \cup \sqrt{C} \cup \bigcup_{x \in A} B(x)(C)}{\cdot B(F)(C)}$$

The third option is that focus is exploited in a devoted syntactic projection. Namely, the operator FS is the head Foc^0 and merges with an ActP with focus as in (61).

$$(61) \quad \llbracket [_{FocP} [_{ActP} [ALI_F \text{ iskambil oynadı}]] [_{Act^\circ} \cdot] \rrbracket [_{Foc^\circ} FS] \rrbracket \\ = FS(\llbracket [_{ActP} [ALI_F \text{ iskambil oynadı}]] [_{Act^\circ} \cdot] \rrbracket)$$

The way the focus operator is syntactically implemented largely depends on the general framework for the syntax/semantics interface. For the purposes of this paper, we will follow the last proposal as in (61).

In the current section, we have assumed that focus has an effect on speech acts; in particular, it leads to a background-focus-alternative structure of speech acts. Section 4.6 will go into greater detail about how this effect is projected from focus on a particular expression within the clause. In the next section we turn to polar questions and will see that the same operator can explain the impact of focus there.

4.2 Focus in polar questions

As we have seen in Section 2.3, in Turkish polar questions the focus exponent attracts the polar question clitic *-mI*. This is the subject in (62)(a) and the object

in (b), ignoring cases of focus projection as mentioned for (24)(b). We assume, as with assertions, that the interrogative speech act is introduced by an Act^0 head.

- (62) a. $[_{\text{Act}^0} [_{\text{TP}} \text{ALI}_F \text{ mi iskambil oynadı }][_{\text{Act}^0} ?]]$
 ‘Was it Ali that played cards?’
 b. $[_{\text{Act}^0} [_{\text{TP}} \text{Ali } \dot{\text{ISKAMBIL}}_F \text{ mi oynadı }][_{\text{Act}^0} ?]]$
 ‘Was it cards that Ali played?’

$[_{\text{Act}^0} ?]$ triggers a monopolar question as introduced in Section 3, as in (63).

$$(63) \quad \llbracket [_{\text{Act}^0} ?] \rrbracket = \lambda p \lambda C [\sqrt{C} \cup \{c \in C \mid p \in c\}] = \lambda p \lambda C [\sqrt{C} \cup C + \cdot p] = \lambda p [?p]$$

In line with its failure to occur in constituent questions and its mobility in the sentence (Sections 2.2 and 2.3), we assume that the clitic *-mi* is a focus marker, licensed under the interrogative Act head. In this view, *-mi* is attached to the constituent that introduces alternatives, just as main prominence “attaches” to the F-marked constituent in assertions. Applying (63) to (62)(a), we reach the following derivation:

$$(64) \quad \begin{aligned} & \llbracket [_{\text{Act}^0} [_{\text{TP}} \text{ALI}_F \text{ mi iskambil oynadı }][_{\text{Act}^0} ?]] \rrbracket \\ &= \llbracket [_{\text{Act}^0} ?] \rrbracket (\llbracket [_{\text{TP}} \text{ALI}_F \text{ mi iskambil oynadı }] \rrbracket) \\ &= \lambda p \lambda C [\sqrt{C} \cup C + \cdot p] (\langle \lambda x [\varphi_{xc}], a, \{a, m\} \rangle) \\ &= \langle \lambda x \lambda C [\sqrt{C} \cup C + \cdot \varphi_{xc}], a, \{a, m\} \rangle \end{aligned}$$

How is focus interpreted in polar questions? Precisely as in assertions, by the FS operator (57). The derivation employs function composition; cf. Section 4.6 for details. The background of the resulting meaning is a function from entities to interrogative updates. After applying the FS operator we get the following result:

$$(65) \quad \begin{aligned} \text{FS}(64) &= \lambda C \frac{C = \sqrt{C} \cup \bigcup_{x \in \{a, m\}} C + \cdot \varphi_{xc}}{\sqrt{C} \cup C + \cdot \varphi_{ac}} \\ &= \lambda C \frac{C = \sqrt{C} \cup C + \cdot \varphi_{ac} \cup C + \cdot \varphi_{mc}}{\sqrt{C} \cup C + \cdot \varphi_{ac}} \end{aligned}$$

The condition on the input CS C , expressed on the upper line of (65), states that the question ‘Who of Ali and Merve played cards?’ is asked. If satisfied, the question $C + ?\varphi_{ac}$, ‘Did Ali play cards?’ is asked, as stated in the lower line of (65). The condition that this update places on the input CS is the same as with focused assertions, cf. (58). As with assertions, we may assume that the FS operator composes with the question operator $[_{\text{Act}^0} ?]$ as in (66) to a polar

question operator $[\text{Act}^\circ \text{ FS } ?]$, or that there is a separate syntactic level that exploits the focus structure as in (67).

$$(66) \quad \llbracket [\text{Act}^\circ \text{ FS } ?] \rrbracket (\langle B, F, A \rangle) = \text{FS}(\llbracket [\text{Act}^\circ ?] \rrbracket (\langle B, F, A \rangle)) = \lambda C \frac{C = \sqrt{C} \cup \bigcup_{x \in A} ?B(x)(C)}{?B(F)(C)}$$

$$(67) \quad \begin{aligned} & \llbracket [\text{FocP} [\text{ActP} [\text{TP} \text{ ALI}_F \text{ mi iskambil oynadı}] [\text{Act}^\circ ?]] [\text{Foc}^\circ \text{ FS }]] \rrbracket \\ & = \text{FS}(\llbracket [\text{ActP} [\text{TP} \text{ ALI}_F \text{ mi iskambil oynadı}] [\text{Act}^\circ ?]] \rrbracket) \end{aligned}$$

In order to see how such questions work in discourse, recall that the individual stages of a conversation are represented in a CS development, cf. (40). Let us assume an input CS in which it is asked who of three persons, Ali, Merve and Hasan, played cards yesterday; this is the last CS in the input CS development (68)(a). The input requirement of the focused polar question (64), now with $\{a, m, h\}$ as alternatives, is satisfied, and so the question whether Ali played cards can be asked. This results in the final CS in the resulting output CS development in (68)(b), where each branch of the input CS is updated by $+ \cdot \varphi_{ac}$, and $C_0 + \varphi_{ac} + \varphi_{ac}$ is simplified to $C_0 + \varphi_{ac}$. In fact, as $C_0 + \cdot \varphi_{ac} \supseteq C_0 + \cdot \varphi_{mc} + \cdot \varphi_{ac}$ and $C_0 + \cdot \varphi_{ac} \supseteq C_0 + \cdot \varphi_{hc} + \cdot \varphi_{ac}$, a further simplification is possible, resulting in (68)(c).

$$(68) \quad \begin{aligned} \text{a. } & \langle \dots, [\sqrt{C_0} \cup C_0 + \cdot \varphi_{ac} \cup C_0 + \cdot \varphi_{mc} \cup C_0 + \cdot \varphi_{hc}] \rangle + \\ & \lambda C \frac{C = \sqrt{C} \cup C + \cdot \varphi_{ac} \cup C + \cdot \varphi_{mc} \cup C + \cdot \varphi_{hc}}{\sqrt{C} \cup C + \cdot \varphi_{ac}} \\ \text{b. } & = \langle \dots, [\sqrt{C_0} \cup C_0 + \cdot \varphi_{ac} \cup C_0 + \cdot \varphi_{mc} \cup C_0 + \cdot \varphi_{hc}], \\ & \quad [\sqrt{C_0} \cup C_0 + \cdot \varphi_{ac} \cup C_0 + \cdot \varphi_{mc} + \cdot \varphi_{ac} \cup C_0 + \cdot \varphi_{hc} + \cdot \varphi_{ac}] \rangle \\ \text{c. } & = \langle \dots, [\sqrt{C_0} \cup C_0 + \cdot \varphi_{ac} \cup C_0 + \cdot \varphi_{mc} \cup C_0 + \cdot \varphi_{hc}], [\sqrt{C_0} \cup C_0 + \cdot \varphi_{ac}] \rangle \end{aligned}$$

In case of a positive answer to this question, the proposition φ_{ac} becomes established. Let us assume that *evet* ‘yes’ anaphorically picks up the TP proposition of the antecedent clause, φ_{ac} , and asserts it, as illustrated in (69) (cf. Krifka 2013, Krifka 2015). The proposition φ_{ac} becomes established in the final step.

$$(69) \quad \begin{aligned} \text{a. } & (68)(c) + \text{Evet ‘yes’} \\ \text{b. } & = (68)(c) + \cdot \varphi_{ac} \\ \text{c. } & = \langle \dots, [\sqrt{C_0} \cup C_0 + \cdot \varphi_{ac} \cup C_0 + \cdot \varphi_{mc} \cup C_0 + \cdot \varphi_{hc}], [\sqrt{C_0} \cup C_0 + \cdot \varphi_{ac}], \\ & \quad [C_0 + \cdot \varphi_{ac}] \rangle \end{aligned}$$

The negative answer $\neg \varphi_{ac}$ requires a retraction that restores the previous CS, at which the negation of the antecedent proposition can be asserted, cf. (70). For the final step, notice that $C_0 + \cdot \varphi_{ac} + \neg \varphi_{ac} = \emptyset$, as no commitment state can contain both a proposition and its negation.

- (70) a. (68)(c) + *Hayır* ‘no’
 b. = (68) + $\mathfrak{R} + \neg\varphi_{ac}$
 c. = $\langle \dots, [\sqrt{C_0} \cup C_0 + \varphi_{ac} \cup C_0 + \varphi_{mc} \cup C_0 + \varphi_{hc}], [\sqrt{C_0} \cup C_0 + \varphi_{ac}],$
 $[\sqrt{C_0} \cup C_0 + \varphi_{ac} \cup C_0 + \varphi_{mc} \cup C_0 + \varphi_{hc}]\rangle + \neg\varphi_{ac}$
 d. = $\langle \dots, [\sqrt{C_0} \cup C_0 + \varphi_{ac} \cup C_0 + \varphi_{mc} \cup C_0 + \varphi_{hc}], [\sqrt{C_0} \cup C_0 + \varphi_{ac}],$
 $[\sqrt{C_0} \cup C_0 + \varphi_{ac} \cup C_0 + \varphi_{mc} \cup C_0 + \varphi_{hc}],$
 $[C_0 + \varphi_{mc} + \neg\varphi_{ac} \cup C_0 + \varphi_{hc} + \neg\varphi_{ac}]\rangle$

At this point, it is established that Ali did not play cards. But the resulting CS contains a part of the original question, who of Merve and Hasan played cards, represented in the two continuations in the last CS in the CS development (70) (d). This is a proper CS to utter a focused assertion:

- (71) a. (70)(d) + $FS(\llbracket_{ActP[TP]MERVE_F} iskambil oynadı \rrbracket_{Act^o \cdot})$
 b. = (70)(d) + $\lambda C \frac{C = \sqrt{C} \cup C + \varphi_{mc} \cup C + \varphi_{hc}}{C + \varphi_{mc}}$
 c. = $\langle \dots, [C_0 + \varphi_{mc} + \neg\varphi_{ac} \cup C_0 + \varphi_{hc} + \neg\varphi_{ac}],$
 $[C_0 + \varphi_{mc} + \neg\varphi_{ac} + \varphi_{mc} \cup C_0 + \varphi_{hc} + \neg\varphi_{ac} + \varphi_{mc}]\rangle$
 d. = $\langle \dots, [C_0 + \varphi_{mc} + \neg\varphi_{ac} \cup C_0 + \varphi_{hc} + \neg\varphi_{ac}], [C_0 + \varphi_{mc} + \neg\varphi_{ac}]\rangle$

For the last step, notice that $[C_0 + \varphi_{mc} + \neg\varphi_{ac}] \supseteq [C_0 + \varphi_{hc} + \neg\varphi_{ac} + \varphi_{mc}]$. The output CS then contains the asserted proposition φ_{mc} and the negated $\neg\varphi_{ac}$.

In this way, we capture the observed answer pattern to polar questions with focus, namely that a positive answer is taken to be complete whereas a negative answer on its own is felt to be insufficient, cf. the discussion after (5).

We now turn to the issue of how questions with sentence-final *-mI* like (13) are interpreted. Such questions are felt to be unbiased toward a particular answer and *no* is a sufficient answer. For this reason, the assumed monopolar interpretation for questions may be considered problematic. One option at this point is to stipulate that sentence-final *mI* expresses a bipolar question, and focus-marking *-mI* occurs only in monopolar questions. Alternatively, we can generalize our current analysis in such a way that *-mI* always attaches to an alternative-introducing constituent, and thus have a uniform analysis of *-mI*, which we will be developing throughout the rest of this paper.

The candidate for the alternative-introducing constituent located in the final verbal complex is an operator POS that expresses the truth polarity of the clause. Syntactically, this operator would head a polarity phrase PolP. This operator is

interpreted by a function $\lambda p[p]$ which maps a proposition to itself, and comes with a counterpart $\lambda p[\neg p]$ that maps a proposition to its negation. This results in (72):

$$(72) \quad \llbracket [_{\text{ActP}} [_{\text{PolP}} [_{\text{TP}} \text{Ali iskambil oynadı}] [_{\text{Pol}^\circ} \text{POS}]_F \text{ml}] [_{\text{Act}^\circ} ?]] \rrbracket \\ = \langle \lambda p \lambda C [\sqrt{C} \cup C + \cdot P(\varphi_{ac})], \lambda p[p], \{\lambda p[p], \lambda p[\neg p]\} \rangle$$

Applying the FS operator to (72) we get a CS update that requires from the input commitment space C that it has two continuations, that Ali played cards or that Ali did not play cards. If this is satisfied, the monopolar question if Ali played cards is asked:

$$(73) \quad \text{FS}(72) = \lambda C \frac{C = \sqrt{C} \cup C + \cdot \varphi_{ac} \cup C + \cdot \neg \varphi_{ac}}{\sqrt{C} \cup C + \cdot \varphi_{ac}}$$

(73) differs from simple monopolar questions such as (45), *Did Ali play cards?* as it presupposes a bipolar question. But (73) also differs from bipolar disjunctive questions such as (49) *Did Ali play cards or not?* insofar as it is a monopolar question. Due to the bipolar presupposition, (73) is unbiased toward a ‘no’ answer in spite of being a monopolar question. Yet it is different from the corresponding negative question (74), which has the same presupposition but asks a different monopolar question:

$$(74) \quad \llbracket [_{\text{FocP}} [_{\text{ActP}} [_{\text{PolP}} [_{\text{TP}} \text{Ali iskambil oyna-ma-dı}] [_{\text{Pol}^\circ} \text{NEG}]_F \text{ml}] [_{\text{Act}^\circ} ?]] [_{\text{Foc}^\circ} \text{FS}] \rrbracket \\ = \lambda C \frac{C = \sqrt{C} \cup C + \cdot \varphi_{ac} \cup C + \cdot \neg \varphi_{ac}}{\sqrt{C} \cup C + \cdot \neg \varphi_{ac}}$$

The difference between (73) and (74) is that in case of the positive question (73), a negative answer would require prior retraction, whereas for the negated question (74), it would be the non-negated, positive answer that requires retraction.

4.3 Exhaustivity

This section takes on an interesting side issue, and may be skipped without affecting the general understanding of this paper.

Assertion with focus does not only presuppose a certain interrogative input CS but typically also indicates that the answer is the only one that the speaker can truthfully provide for the question. In Turkish, this is particularly visible in the arising exhaustivity inferences related to FPQs and the asymmetry between FPQs and CTPQs in this respect (cf. Section 2.4).

We can model this exhaustivity effect as a condition on the output CS: The speaker excludes commitments concerning the alternatives to the assertion actually

made. This can be expressed by adding to the output CS the denegations, cf. (39)(d), of all alternative assertions. Denegation of an assertion expresses that a speaker refrains from that assertion. This may be because the assertion would commit the speaker to a false proposition or to a proposition without sufficient evidence, reflecting Grice's maxim of quality: Do not say things you do not have evidence for or believe to be false. The addressee will be able to work out by abduction that these are the likely reasons for limiting the assertion in this way, which represents the implicated status of this information.¹⁴ To model this implicature, we assume a variant of the FS operator as in (75). It uses the generalized set subtraction as defined in (76), which results in the subtraction of all sets S' in a set of sets $\mathfrak{S}$ from S , provided S is not a subset of S' .

$$(75) \quad \text{FS-EXH}(\langle B, F, A \rangle) = \lambda C \frac{C = \sqrt{C} \cup \bigcup_{x \in A} B(x)(C)}{B(F)(C) - \{B(x)(C) | x \in A\}}$$

$$(76) \quad S - \mathfrak{S} = \bigcup \{S - S' \mid S \not\subseteq S' \wedge S' \in \mathfrak{S}\},$$

e.g. $S_1 - \{S_1, S_2, S_3\} = [S_1 - S_2] \cup [S_1 - S_3] = S_1 - S_2 - S_3$, if $S_1 \not\subseteq S_2$ and $S_1 \not\subseteq S_3$.

When FS-EXH is applied to example (54), $\langle \lambda x \lambda C [C + \cdot \varphi_{xc}], a, \{a, m\} \rangle$, we get (77). Note that the resulting output does not contain the proposition φ_{mc} .¹⁵

$$(77) \quad \text{FS-EXH}(54) = \lambda C \frac{C = \sqrt{C} \cup C + \cdot \varphi_{ac} \cup C + \cdot \varphi_{mc}}{[C + \cdot \varphi_{ac}] - \{C + \cdot \varphi_{ac}, C + \cdot \varphi_{mc}\}} = \lambda C \frac{C = \sqrt{C} \cup C + \cdot \varphi_{ac} \cup C + \cdot \varphi_{mc}}{[C + \cdot \varphi_{ac}] - [C + \cdot \varphi_{mc}]}$$

We can differentiate between the effect of FS and exhaustivity by assuming a separate operator EXH that reduces an input CS by subtracting all assertions from an alternative set that have not been already established, as in (78). The operator FS-EXH can then be defined by function composition of the operators FS and EXH, as in (79):

$$(78) \quad \text{EXH}(\langle B, A \rangle) = \lambda C [C - \bigcup_{x \in A} B(x)(C)]$$

$$(79) \quad \text{FS-EXH}(\langle B, F, A \rangle) = \text{FS}(\langle B, F, A \rangle) ; \text{EXH}(\langle B, A \rangle) = \lambda C [\text{EXH}(\langle B, A \rangle)(\text{FS}(\langle B, F, A \rangle)(C))]$$

¹⁴ In case the CS is updated not by a simple proposition but by the commitment to a proposition by the speaker, as in Krifka (2015), this would not result in the denegation of the proposition φ_{mc} itself, but rather in the denegation that the speaker commits to the proposition φ_{mc} . This reflects the nature of the scalar implicature quite well, as the speaker might refrain from asserting alternative propositions due to lack of knowledge.

¹⁵ Implicated exhaustivity is different from asserted exhaustivity, which would be expressed by propositional focus operators like *sadece* 'only', which would result in the update $C + \cdot \varphi_{ac} + \neg \cdot \varphi_{mc}$ (cf. Zimmermann and Onea 2011).

Separating exhaustivity from the FS operator appears useful because not every instance of focus leads to exhaustivity. In particular, in a sequence of assertions connected by conjunction, the individual assertions do not implicate exhaustivity. Assume that there are three persons, Ali, Merve, and Hasan; the individual conjuncts in (80) are not interpreted exhaustively, only the whole conjunction is, implicating that Hasan did not play cards.

- (80) ALI_F *iskambil oynadı ve* $MERVE_F$ *iskambil oynadı.*
 ‘ ALI_F played cards, and $MERVE_F$ played cards.’

We model this by Boolean conjunction of the two assertions, followed by exhaustivity:

- (81) $FS(\langle \lambda x[\varphi_{xc}], a, \{a, m, h\} \rangle) \& FS(\langle \lambda x[\varphi_{xc}], m, \{a, m, h\} \rangle); EXH(FS(\langle \lambda x[\varphi_{xc}], \{a, m, h\} \rangle))$

The conditions of the FS updates require that the question who of Ali, Merve and Hasan played cards is asked, $C = \sqrt{C} \cup C + \cdot\varphi_{ac} \cup C + \cdot\varphi_{mc} \cup C + \cdot\varphi_{hc}$. The Boolean conjunction leads to the output $C' = C + \cdot\varphi_{ac} \cap C + \cdot\varphi_{mc}$. Application of EXH reduces this set to $C' - C' + \cdot\varphi_{hc}$ (notice that in C' , φ_{ac} and φ_{mc} are already established, and hence we have $C' \subseteq C' + \cdot\varphi_{ac}$, $C' \subseteq C' + \cdot\varphi_{mc}$). That is, (80) implicates that Hasan does not play cards.

So far, we presented a way of modeling exhaustivity as an implicature arising in the output CS, cf. (75). Alternatively, we can model exhaustivity as a requirement by the input CS, ruling out alternative assertions. This is achieved by the operator FS-EXH2 in (82):

- (82) $FS-EXH2(\langle B, F, A \rangle) = \lambda C \frac{C = \sqrt{C} \cup \bigcup_{x \in A} [B(x)(C) - \bigcup_{y \in A} B(y)(C)]}{B(F)(C)}$

The input commitment space is restricted to continuations that consist of each alternative $B(x)$ excluding all other alternatives $B(y)$, with $y \neq x$. This “presupposed” exhaustivity corresponds to the partition interpretation of background questions of Groenendijk and Stokhof (1984). For example, when applied to (54) this results in (83), where C is restricted to continuations that assert that Ali played cards and denegate the assertion that Merve played cards, and that Merve played cards and denegate that Ali played cards.¹⁶

¹⁶ It might well be that in English, both operators, FS-EXH and FS-EXH2, are present, the first for assertions with regular focus, and the second for assertions where focus is expressed by a cleft clause.

$$(83) \text{ FS-EXH2}(\langle \lambda x \lambda C [C + \cdot \varphi_{xc}], a, \{a, m\} \rangle) \\ = \lambda C \frac{C = \sqrt{C} \cup [(C + \cdot \varphi_{ac}) - [C + \cdot \varphi_{mc}]] \cup [(C + \cdot \varphi_{mc}) - [C + \cdot \varphi_{ac}]]}{C + \cdot \varphi_{ac}}$$

The operator FS-EXH2 may also apply to focused polar questions, resulting in a presupposition that only one alternative leads to an assertion that the addressee can commit to: This is illustrated with the interpretation of question (64):

$$(84) \text{ FS-EXH2}(\langle \lambda x \lambda C [\sqrt{C} \cup C + \cdot \varphi_{xc}], a, \{a, m\} \rangle) \\ = \lambda C \frac{C = \sqrt{C} \cup [(\sqrt{C} \cup C + \cdot \varphi_{ac}) - [\sqrt{C} \cup C + \cdot \varphi_{mc}]] \cup [(\sqrt{C} \cup C + \cdot \varphi_{mc}) - [\sqrt{C} \cup C + \cdot \varphi_{ac}]]}{\sqrt{C} \cup C + \cdot \varphi_{ac}} \\ = \lambda C \frac{C = \sqrt{C} \cup [(C + \cdot \varphi_{ac}) - [C + \cdot \varphi_{mc}]] \cup [(C + \cdot \varphi_{mc}) - [C + \cdot \varphi_{ac}]]}{\sqrt{C} \cup C + \cdot \varphi_{ac}}$$

We leave it an open question in which exact way exhaustivity arises in focused polar questions in Turkish and keep on using the simple FS operator. In our discussion of contrastive topics, we will see that they come with an anti-exhaustivity effect; this will be discussed in Section 5.2.

4.4 Alternative questions

Having discussed focus in assertions and polar questions, we now turn to alternative questions, which in Turkish have striking commonalities with polar questions. Namely, we have seen that the clitic *-mI* also appears in alternative questions, and not only once but on both disjuncts, as in (85):

$$(85) \text{ } \textit{ALİ}_F \textit{ mi, (yoksa) MERVE}_F \textit{ mi iskambil oyna-dı?} \\ \text{Ali MI or Merve MI card play-PAST} \\ \text{'Did ALİ or MERVE play cards?'}$$

As an alternative question, this presupposes that either Ali or Merve played cards. Both of the focused expressions host *-mI*, and a disjunction marker devoted to alternative questions (*yoksa*) may be used. This is different from simple polar questions with a propositional disjunction, which are expressed by the regular disjunction *veya* and a single *-mI* for marking the focus. For example, (85) cannot be answered by *evet* 'yes' or *hayır* 'no', but (86) can.

$$(86) [\textit{ALİ VEYA MERVE}]_F \textit{ mi iskambil oyna-dı?} \\ \text{Ali or Merve MI cards play-PAST} \\ \text{'Is it either one of Ali and Merve who played cards?'}$$

Example (85) illustrates an alternative question with DP alternatives. The same alternative questions can be expressed by disjoining two full polar questions, as in (87).

- (87) ALI_F *mi iskambil oyna-dı* *yoksa* $MERVE_F$ *mi iskambil oyna-dı*?
 Ali MI card play-PAST or Merve MI card play-PAST
 ‘Did Ali play cards, or did Merve play cards?’

The fact that alternative questions with constituent alternatives like (85) lead to the same interpretation as the disjunction of two polar questions as in (87) follows in an ellipsis approach as argued for by Romero and Han (2003). We adopt this analysis, where parts of one of the clausal alternatives surrounding the *-mi*-marked/focused phrase in (87) are deleted under identity to lead to the superficially different (85). Turkish presents particularly good evidence for this. Either of the disjoined polar questions can undergo ellipsis while *yoksa* unambiguously ensures that these are alternative questions.

- (88) ALI_F *mi iskambil-oynadı* (*yoksa*) $MERVE_F$ *mi iskambil oynadı*? cf. (85)
 ALI_F *mi iskambil oynadı* (*yoksa*) $MERVE_F$ *mi iskambil-oynadı*? cf. (22)(a)

As for the interpretation, Commitment Space semantics offers a straightforward way of representing AltQs as polar question disjunction. Speech act disjunction is expressed by the Boolean disjunction operator on speech acts $\vee$, cf. (39)(c). As questions do not change the root of the input, disjunction leads to an output CS that is rooted as well. This is illustrated in the following derivation of (87). We assume that the alternatives of *a* and *m*, $ALT(a)$ and $ALT(m)$, are identical, namely the set $A = \{a, m\}$; that is, explicit alternative questions mention all the alternatives of their foci.

- (89) $FS(\llbracket [_{ActP} [_{TP} ALI_F \text{ mi iskambil oynadı }] [_{Act^o?}]] \rrbracket)$
 $\vee FS(\llbracket [_{ActP} [_{TP} MERVE_F \text{ mi iskambil oynadı }] [_{Act^o?}]] \rrbracket)$
 $= \lambda C \frac{C = \sqrt{C} \cup \bigcup_{x \in A} ?(\varphi_{xc})}{?(\varphi_{ac})} \vee \lambda C \frac{C = \sqrt{C} \cup \bigcup_{x \in A} ?(\varphi_{xc})}{?(\varphi_{mc})}$
 $= \lambda C \left[\frac{C = \sqrt{C} \cup \bigcup_{x \in A} ?(\varphi_{xc})}{?(\varphi_{ac})} \cup \frac{C = \sqrt{C} \cup \bigcup_{x \in A} ?(\varphi_{xc})}{?(\varphi_{mc})} \right]$
 $= \lambda C \frac{C = \sqrt{C} \cup \bigcup_{x \in A} ?(\varphi_{xc})}{?(\varphi_{ac})(C) \cup ?(\varphi_{mc})(C)}$
 $= \lambda C \frac{C = \sqrt{C} \cup C + \cdot \varphi_{ac} \cup C + \cdot \varphi_{mc}}{\sqrt{C} \cup C + \cdot \varphi_{ac} \cup C + \cdot \varphi_{mc}}, \text{ in case } A = \{a, m\}$

The two disjuncts impose the same requirement on the input CS, hence they can be combined, and their union also imposes this requirement. In the input CS the question ‘Who played cards?’ is asked. The output CS is the disjunction of the

monopolar questions ‘Did ALİ play cards?’ and ‘Did MERVE play cards?’ In case the alternatives of the question ‘Who played cards?’ are just Ali and Merve, the output CS is identical to the input CS, which may look as if the alternative question does not have any communicative effect. However, asking this question would trigger an accommodation of the input CS, hence a communicative effect does arise.

This analysis of alternative questions correctly predicts an implicature that one of the alternative propositions is true, i. e. that either Ali or Merve played cards in (85), as otherwise the input CS could not be updated. This is a further motivation for our analysis of questions like *ALİ_F mi iskambil oynadı?* as monopolar: Analyzed as bipolar questions, as in ‘Did Ali play cards or not?’, the disjunction of the two questions would not have the implicature that one of the propositions, ‘Ali played cards’ and ‘Merve played cards’, is true. If these questions were bipolar, there would be four options: Ali played cards, Merve played cards, Ali and Merve played cards, and neither played cards; the last option is incompatible with the implicature of AltQs that one of the alternative propositions is true.

Alternative questions also come with the implicature that *only* one of the alternative propositions is true. This could be achieved if we assume either an exhaustivity operator or that speech act disjunction *V* competes with speech act conjunction *&*, leading to a scalar implicature that update with both disjuncts is not possible. In addition, focus can be understood exhaustively, which would also generate the implicature that only one of the alternative updates is possible.

The analysis of alternative questions predicts that the two subquestions must impose the same requirements on the input CS. If the focus is on different constituents, the background differs, as in (90), and the result is unacceptable:

- (90) **ALİ_F mi iskambil oynadı yoksa Merve İSKAMBİL_F mi oynadı?*
 Ali MI card play-PAST or Merve card MI play-PAST
 ‘*Was it Ali who played cards, or was it cards that Merve played?’

This is because the two disjuncts impose different requirements on the input CS and cannot be conjoined.¹⁷ A similar problem would arise if the foci in the two

¹⁷ Or rather, the conjunction would allow only a degenerate input in which the proposition that Ali played cards and that Merve played cards is already established.

disjunct propositions have the same syntactic role, but the background differs in other ways, as in (91):

- (91) * ALI_F *mi iskambil oynadı yoksa MERVE_F mi kitap oku-du?*
 Ali MI card play-PAST or Merve MI book read-PAST
 ‘*Was it Ali who played cards, or was it Merve who read books?’

How do we account for the incompatibility between alternative questions and response particles *evet* ‘yes’ or *hayır* ‘no’, which sets them apart from regular polar questions (Romero and Han 2003 among others)? We suggest that in our treatment of AltQs as disjunctions of polar questions, each alternative would present two equally salient propositional discourse referents, hence the anaphoric responses ‘yes’ and ‘no’ would be systematically ambiguous (see Krifka 2013; Roelofsen and Farkas 2015).

Before we conclude, let us observe that in contrast, the non-alternative question in (86) is interpreted as involving a propositional disjunction, which renders it a simple monopolar question. Namely, in cases where *Ali veya Merve* ‘Ali or Merve’ is focused, we would be considering alternatives to this disjunctive quantifier. In a universe with three persons as candidates, a, m, h, this would minimally create the alternative set {avm, h}¹⁸ and lead to the interpretation (92), which requires an input CS in which it is asked whether either Ali or Merve, or Hasan plays cards, delivering an output CS in which it is asked whether it was Ali or Merve who played cards. As with any two monopolar questions matching in the relevant features, the two can combine into an alternative question (*Did Ali or Merve play cards, or Hasan?*) as a result of speech act disjunction.

- (92) $FS(\llbracket [_{ActP} [_{TP} [ALI VEYA MERVE]_F mi iskambil oynadı] [_{Act?}] \rrbracket)$
 $= \lambda C \frac{C = \sqrt{C} \cup C + \cdot [\varphi_{ac} \vee \varphi_{mc}] \cup C + \cdot \varphi_{hc}}{\sqrt{C} \cup C + \cdot [\varphi_{ac} \vee \varphi_{mc}]}$

We have seen how alternative questions are formed by a disjunction over monopolar questions. We now turn to constituent questions for which we will argue that they also involve, in their semantic representation, a disjunction over monopolar questions.

¹⁸ The disjunction avm would actually require lifting of individuals to quantifiers, $\lambda P[P(a) \vee P(m)]$ and $\lambda P[P(h)]$.

4.5 Constituent questions

Constituent questions in Turkish form with *wh*-words such as *kim* ‘who’, *ne* ‘what’, and *ne zaman* ‘when’. They do not undergo *wh*-movement but carry nuclear accent and can be optionally focalized, similar to the *-mI*-marked phrases in polar questions. Turkish *wh*-words lack an indefinite reading, contrary to what is reported for many other languages. Importantly, constituent questions do not carry the clitic *-mI* (see Sections 2.1 and 2.2).

We assume that *wh*-constituents generate a meaning similar to constituents in focus, except that they do not come with the focus meaning itself. They only have a set of alternative meanings produced by the domain of the *wh*-word, e. g. *kim* ‘who’ for persons. Within the framework of alternative semantics, this analysis was proposed by Kratzer and Shimoyama (2017) for Japanese, also a *wh*-in-situ language. In the structured meaning framework used in the current paper, a *wh*-question will be represented as a pair of a background meaning and a set of alternatives $\langle B, A \rangle$, in contrast to the background-focus-alternative meaning in the case of focus, $\langle B, F, A \rangle$. As an example, consider the following interrogative clause expressing the question ‘who played cards’ as a structured proposition with a restriction to persons:

- (93) $\llbracket [_{TP} \text{Kim}_{wh} \text{ iskambil oynadı}] \rrbracket$
 $= \langle \lambda x \lambda i [x \text{ played cards in } i], \lambda x [x \text{ is a person}] \rangle$
 $= \langle \lambda x [\varphi_{x_C}], \text{PERSON} \rangle^{19}$

The question operator $[_{Act^o} ?]$ could not apply to (93) because this meaning is of the wrong type: The question operator expects a proposition, not a background-alternative structure. The background-alternative structure also could not be passed higher up, as there is no operator that could deal with it (recall that the FS operator expects a $\langle B, F, A \rangle$ structure, not a $\langle B, A \rangle$ structure). Hence we have to assume that constituent questions require a question operator dedicated to constituent questions. We propose an operator $[_{Act^o} ?^{wh}]$ with the interpretation in (94), expressing a disjunction over alternative CS updates:

- (94) $\llbracket ?^{wh} \rrbracket = \lambda \langle B, A \rangle \lambda C \bigcup_{x \in A} [?(B(x))(C)]$

¹⁹ Alternatively, meanings of constituent questions could be represented by restricted functions, e. g. $\lambda x \in \text{PERSON} \lambda i [x \text{ played cards in } i]$, or, using individual concepts, $\lambda x \in \text{PERSON} \lambda i [x(i) \text{ played cards in } i]$. We use the present format because of its greater formal similarity with the way we represented background-focus-alternative structures.

This takes a background-alternative structure and creates a disjunctive question over all alternatives, as given by the *wh*-constituent. Notice that this meaning is built on the meaning of the standard question operator $[\text{Act}^\circ ?]$, as hinted in Section 4.1. In our example, this leads to the following interpretation:

$$\begin{aligned}
 (95) \quad & \llbracket [\text{ActP} [\text{TP} \text{Kim}_{\text{wh}} \text{ iskambil oynadı}] [\text{Act}^\circ ?^{wh}]] \rrbracket \\
 &= \llbracket ?^{wh} \rrbracket (\llbracket [\text{TP} \text{Kim}_{\text{wh}} \text{ iskambil oynadı}] \rrbracket) \\
 &= \lambda \langle B, A \rangle \lambda C \cup_{x \in A} [\llbracket ?^{wh} \rrbracket (B(x))(C)] (\langle \lambda x [\varphi_{xc}], \text{PERSON} \rangle) \\
 &= \lambda C \cup_{x \in \text{PERSON}} [\sqrt{C} \cup C + \cdot \varphi_{xc}]
 \end{aligned}$$

This results in an update function that maps an input commitment space C to the union of all questions for the proposition x *played cards*, where x ranges over persons. Effectively, the input commitment space C is restricted to those continuations that contain propositions φ_{xc} , where x is a person. This is also the CS at which a *-mI*-question like *ALİ_F mi iskambil oynadı* could be asked, cf. (65).

Different from *-mI*-questions, where *-mI* attaches to a constituent in focus, constituent questions do not presuppose a particular input CS. This reflects that a constituent question like *Kim iskambil oynadı?* can be uttered out of the blue; it just requires that there is evidence that someone played cards. We assume that a focused polar question like *ALİ_F mi iskambil oynadı?* requires a richer context, in which an interest in an answer to the question who played cards is assumed.

4.6 The construction of background-(focus)-alternative structures

So far we were not concerned with how meanings with focus and constituent question meanings were constructed. We now address this issue because we want to show how the illocutionary operators FS and $?^{wh}$ can access a focus or a *wh*-constituent within a clause. This section is a bit technical, and may be skipped without affecting understanding of the rest of the paper.

There are various accounts for the projection of focus information to focus-sensitive operators that make use of focus. In the Alternative Semantics framework, Rooth (1985) formulates a projection rule for alternatives alongside the composition of meanings; Rooth (1992) introduces a squiggle operator “~” that passes along focus information to the operators that need them. In the Structured Meaning framework, Krifka (1992) proposed a theory of how $\langle B, F, A \rangle$ structures are projected; Krifka (2006) argues for a hybrid framework in which focus alternatives are projected to syntactic constituents with island properties

(so-called focus phrases, cf. Drubig 1994), and structured meanings relate syntactic islands to focus-sensitive operators.

As we use structured meanings to represent focus in the current article, we will employ the focus projection rules of Krifka (1992). Consider the case of the interpretation of an expression containing two sub-constituents, where one of them is a structured meaning.

- (96) If two regular meanings α , β combine to $\langle \alpha, \beta \rangle$,
 then a background-focus-alternative meaning $\langle \lambda X[\alpha[X]], F, A \rangle$ combines with β to $\langle \lambda X[(\alpha[X], \beta)], F, A \rangle$.

That is, the focus F and the alternatives A of the meaning α are projected to the result of the combination of α and β . This rule is illustrated in (97), with the assumption that the alternatives to *Ali* are *Ali* and *Merve*.

- (97) a. $\llbracket ALI_F \rrbracket = \langle \lambda x[x], a, \{a, m\} \rangle$
 b. $\llbracket iskambil oynadı \rrbracket = \lambda x[\varphi_{xc}]$
 c. $\llbracket iskambil oynadı \rrbracket (\llbracket ALI_F \rrbracket) = \langle \lambda x[\varphi_{xc}], a, \{a, m\} \rangle$

In this way, information about the meaning of the expression in focus and its alternatives is projected from a subconstituent, ALI_F , to the resulting complex expression. In (97)(c), this is a structured proposition. The focus and alternatives of this structure can project further, using the same rule (96), to a structured update function for CSs as in (54), an assertion with focus:

- (98) $\llbracket [\text{Act}^\circ \cdot] \rrbracket (\llbracket [\text{TP} ALI_F iskambil oynadı] \rrbracket) = \langle \lambda x \lambda C [C + \cdot \varphi_{xc}], a, \{a, m\} \rangle$

The result of this combination can be used by an operator like FS that takes such structured update functions and expresses an assertion that makes use of the focus and the alternatives, as was the case in (65).

Now we consider cases in which two background-focus structures are combined, which follows the rule given in (99).

- (99) If two regular meanings α , β combine to $\langle \alpha, \beta \rangle$,
 then background-focus-alternative meanings $\langle \lambda X[\alpha[X]], F, A \rangle$, $\langle \lambda Y[\beta[Y]], G, B \rangle$ combine to $\langle \lambda \langle X, Y \rangle [(\alpha[X], \beta[Y])], \langle F, G \rangle, A \times B \rangle$

Here, $\langle X, Y \rangle$ is a variable pair $\langle F, G \rangle$, a pair of focus constituents, and $A \times B$ the Cartesian product of the alternatives (cf. Krifka 2001a for arguments why structured

meanings may have advantages over alternative semantics). As an example, consider the following case of multiple focus; we assume that the alternative to cards is domino.

- (100) a. $\llbracket \dot{ISKAMBIL}_F \rrbracket = \langle \lambda y[y], c, \{c, d\} \rangle$
 b. $\llbracket oynadi \rrbracket = \lambda y \lambda x [x \text{ played } y]$
 c. $\llbracket [\dot{ISKAMBIL}_F oynadi] \rrbracket = \langle \lambda y \lambda x [x \text{ played } y], c, \{c, d\} \rangle$
 d. $\llbracket AL\dot{I}_F \rrbracket = \langle \lambda x[x], a, \{a, m\} \rangle$
 e. $\llbracket [{}_{TP} AL\dot{I}_F \dot{ISKAMBIL}_F oynadi] \rrbracket = \langle \lambda \langle x, y \rangle [\varphi_{xy}], \langle a, c \rangle, \{ \langle a, c \rangle, \langle a, d \rangle, \langle m, c \rangle, \langle m, d \rangle \} \rangle$
 f. $\llbracket [{}_{ActP} [{}_{TP} AL\dot{I}_F \dot{ISKAMBIL}_F oynadi] [{}_{Act^o} \cdot]] \rrbracket$
 $= \langle \lambda \langle x, y \rangle \lambda C [C + \cdot \varphi_{xy}], \langle a, c \rangle, \{ \langle a, c \rangle, \langle a, d \rangle, \langle m, c \rangle, \langle m, d \rangle \} \rangle$

The operator FS, cf. (61), can apply to this meaning, yielding a structure that requires that the question ‘Who played what?’ is asked:

$$(101) \quad FS(\llbracket [{}_{ActP} [AL\dot{I}_F \dot{ISKAMBIL}_F oynadi] [{}_{Act^o} \cdot]] \rrbracket) \\
= \lambda C \frac{C = \sqrt{C} \cup C + \bigcup_{\langle x, y \rangle \in \{a, m\} \times \{c, d\}} [C + \cdot \varphi_{xy}]}{C + \varphi_{ac}} \\
= \lambda C \frac{C = \sqrt{C} \cup C + \cdot \varphi_{ac} \cup C + \cdot \varphi_{ad} \cup C + \cdot \varphi_{mc} \cup C + \cdot \varphi_{md}}{C + \varphi_{ac}}$$

In our toy model, the required input CS corresponds to a disjunction of four monopolar questions (did Ali play cards? or did Ali play domino? or did Merve play cards? or did Merve play domino?).

The meaning of constituent questions can be construed in a parallel way, except that constituent questions do not have a focus meaning; they just consist of a background and a set of alternatives. The combination rule has to be adapted accordingly:

- (102) If two regular meanings α, β combine to $\langle \alpha, \beta \rangle$, then
 a. a background-alternative meaning $\langle \lambda X[\alpha[X]], A \rangle$ combines with β to $\langle \lambda X[(\alpha[X], \beta)], A \rangle$
 b. two background-alternative meanings $\langle \lambda X[\alpha[X]], A \rangle, \langle \lambda Y[\beta[Y]], B \rangle$ combine to $\langle \lambda \langle X, Y \rangle [(\alpha[X], \beta[Y])], A \times B \rangle$

We consider, by way of example, the derivation of a simple constituent question meaning ‘Who played cards?’, following rule (102)(a).

- (103) a. $\llbracket [{}_{DP} kim] \rrbracket = \langle \lambda x[x], \text{PERSON} \rangle$
 b. $\llbracket [{}_{VP} iskambil oynadi] \rrbracket = \lambda x[\varphi_{xc}]$
 c. $\llbracket [{}_{TP} Kim iskambil oynadi] \rrbracket = \langle \lambda x[\varphi_{xc}], \text{PERSON} \rangle$

$$\begin{aligned}
 \text{d. } & \llbracket [\text{ActP } [\text{TP } \textit{Kim iskambil oynadı}] [\text{Act}^\circ \text{ ?}^{wh}]] \rrbracket \\
 & = \lambda \langle B, A \rangle \lambda C \cup_{x \in A} [\llbracket \text{ ?}^{wh} \rrbracket (B(x))] (\langle \lambda x [\varphi_{xc}], \text{PERSON} \rangle) \\
 & = \lambda C \cup_{x \in \text{PERSON}} [\sqrt{C} \cup C + \cdot \varphi_{xc}]
 \end{aligned}$$

This restricts the continuations from the roots $\sqrt{C}$ to those in which the propositions ‘x played cards’ are added, where x ranges over persons.

Rule (102)(b) allows the derivation of multiple constituent questions such as ‘Who played what?’. This is illustrated in (104), where we start out with the meaning of *ne oynadı* ‘played what’. We assume that possible objects are restricted by the selectional requirements of the verb *oyna* to things that can be played.

$$\begin{aligned}
 (104) \text{ a. } & \llbracket [\text{VP } \textit{ne oynadı}] \rrbracket = \langle \lambda y \lambda x [\varphi_{xy}], \text{GAME} \rangle \\
 \text{b. } & \llbracket [\text{DP } \textit{kim}] \rrbracket = \langle \lambda x [x], \text{PERSON} \rangle \\
 \text{c. } & \llbracket [\text{TP } \textit{Kim ne oynadı}] \rrbracket = \langle \lambda \langle x, y \rangle [\varphi_{xy}], \text{PERSON} \times \text{GAME} \rangle \\
 \text{d. } & \llbracket [\text{ActP } [\text{TP } \textit{Kim ne oynadı}] [\text{Act}^\circ \text{ ?}^{wh}]] \rrbracket \\
 & = \lambda C \cup_{\langle x, y \rangle \in \text{PERSON} \times \text{GAME}} [\sqrt{C} \cup C + \cdot \varphi_{xy}]
 \end{aligned}$$

This restricts the continuations from the roots $\sqrt{C}$ to those in which the propositions ‘x played y’ are added, where x ranges over persons and y over games. Any one answer is a sufficient reaction to that question, for example the assertion $\cdot \varphi_{ac}$. This reconstructs the so-called single pair “quiz question” interpretation of multiple constituent questions (cf. Comorovski 1996), not the so-called pair-list answer, which would require conjoined answers like $\cdot \varphi_{ac}$ & $\cdot \varphi_{md}$. We will take up the issue of multiple questions in Section 5.6.

We have proposed meaning combination rules for expressions with focus (background-focus-alternative structures) and expressions with a wh-constituent (background-alternative structures). However, we cannot combine an expression with focus with an expression with a wh-constituent because it is unclear how to combine a background-focus-alternative structure $\langle B, F, A \rangle$ with a background-alternative structure $\langle B', A' \rangle$.²⁰ The rules (99) and (102) are silent about this case.²¹ This predicts that accented non-wh-constituents in constituent questions

20 There is a poorly understood apparent counterexample to this, regarding examples with *-mi* in a constituent question (cf. Section 2.2, example (17)). We believe that these are (polar) echo questions of constituent questions and are not ruled out by this restriction. We will not go into an analysis of such cases, but the notion of commitment space development offers a promising way to refer to immediately preceding discourse moves needed for this.

21 A similar motivation is used for the explanation of intervention effects by Beck (2006) within alternative semantics, in particular the observation that a focusing element cannot c-command a wh-constituent. The reason Beck gives is that focus introduces alternatives in addition to the

are interpreted not as focus, but as contrastive topics (cf. Section 5.4). Recall that in Turkish there is evidence for that, as these constituents show leftward movement of the accented element typical of topics and unlike foci, and they work perfectly in contexts of topic shift (cf. Section 2.5).

In spite of this, focus in constituent questions for English and German has been assumed by a number of authors (von Stechow 1982; Kadmon 2001, Kadmon 2009; Büring 2003; Reich 2003). For example, von Stechow considers the minimal pair *Who gave RUTH_F the cake?* and *Who gave Ruth the CAKE_F?* These authors seem to base the assumption of focus in these examples on their intonational properties, such as the fact that the accented element is the single-accented element of the intonational phrase typical of foci, as briefly discussed at the end of Section 2. On the other hand, these constituents certainly can be interpreted as contrastive topics. For example, consider the topic shift case in *What about Ruth? Who gave RUTH a cake?* Here, *RUTH* bears the single falling accent characteristic of focus, but is interpreted as a contrastive topic. We will take up this issue again in Section 5.4 and derive the meaning of these elements as contrastive topics.²²

ordinary meaning, whereas *wh*-constituents only have “alternative” meanings which then are converted to ordinary meanings by a question operator.

22 Note that if one has to, focus in constituent questions could be handled by either syntactic focus movement with focus taking scope over the constituent question, or by a suitable rule for the combination of $\langle B, F, A \rangle$ and $\langle B', A' \rangle$ structures with this effect. The resulting structure would have to be interpreted disjunctively by the FS operator. This is illustrated in the following examples, where we assume that φ_{xyz} stands for ‘x played y on day z’, and {f, s}, Friday and Saturday, are the alternative days.

- (i) a. *What did ALI_F play on Friday?*
 b. $\llbracket \text{FS} \rrbracket (\lambda x [\llbracket ?^{wh} \rrbracket] (\langle \lambda y [\varphi_{xyf}], \{c, d\} \rangle), a, \{a, m\} \rangle)$

$$= \lambda C \frac{C = \sqrt{C} \cup C + \cdot \varphi_{acf} \cup C + \cdot \varphi_{adf} \cup C + \cdot \varphi_{mcf} \cup C + \cdot \varphi_{mdf}}{\sqrt{C} \cup C + \cdot \varphi_{acf} \cup C + \cdot \varphi_{adf}}$$
- (ii) a. *What did Ali play on FRIDAY_F?*
 b. $\llbracket \text{FS} \rrbracket (\lambda z [\llbracket ?^{wh} \rrbracket] (\langle \lambda y [\varphi_{ayz}], \{c, d\} \rangle), f, \{f, s\} \rangle)$

$$= \lambda C \frac{C = \sqrt{C} \cup C + \cdot \varphi_{acf} \cup C + \cdot \varphi_{adf} \cup C + \cdot \varphi_{acs} \cup C + \cdot \varphi_{ach}}{\sqrt{C} \cup C + \cdot \varphi_{acf} \cup C + \cdot \varphi_{adf}}$$

These two questions restrict the input CS *C* in the same way but pose different conditions on *C*: (1) expects that the question *who played what on Friday?* is asked, whereas (2) expects that the question *When did Ali play what?* is asked. These meanings are not identical but interestingly quite similar as if the highlighted expressions were contrastive topics, cf. Section 5.4

5 Contrastive topics in assertions and questions

In the preceding section we have developed a theory for the interpretation of focus in assertions, cf. Section 4.1, and in polar questions, cf. Section 4.2. The alternatives generated by focus were processed by an operator FS that expressed a requirement on the input CS, namely that it be a disjunction of all focus alternatives. The same operator, FS, could be used for assertions and polar questions. We have also shown how polar questions differ from alternative questions and from constituent questions, cf. Sections 4.4 and 4.5, and have provided a mechanism for the computation of focus alternatives, cf. Sections 4.6.

We will now turn to the other type of highlighting, contrastive topic that we have identified for Turkish polar questions in Section 2.4. Our main result will be that both focus and contrastive topics involve alternatives, but they make different use of them: Focus uses alternatives disjunctively, whereas contrastive topic uses them in a conjunctive way. For this reason, we will first consider conjunction of questions in Section 5.1. We then will turn to contrastive topics in assertions, which we will argue to answer conjoined questions in Section 5.2. We then turn to contrastive topics in polar questions in Section 5.3, and in constituent questions in Section 5.4. Section 5.5 will deal with strategies to answer such complex questions, and Section 5.6 will show how the notions of discourse trees and sorting keys are captured in the present framework.

5.1 Conjoined questions

For our analysis of contrastive topic the notion of conjoined questions will be instrumental. Consider the following example:

- (105) *Size iki soru soracağım: Ali ne oynadı, ve Merve ne oynadı?*
 ‘I will ask you two questions: What did Ali play, and what did Merve play?’

Such conjoined questions can be interpreted by dynamic conjunction; or Boolean conjunction $\&$, cf. (39), which yield identical results in case there are no anaphoric bindings. We use Boolean conjunction in (106), and assume that the game alternatives are $\{c, d\}$.

- (106) a. $\llbracket \text{Ali ne oynadı?} \rrbracket = \lambda C [\sqrt{C} \cup \bigcup_{x \in \text{GAME}} C + \cdot \varphi_{ax}]$
 b. $\llbracket \text{Merve ne oynadı?} \rrbracket = \lambda C [\sqrt{C} \cup \bigcup_{x \in \text{GAME}} C + \cdot \varphi_{mx}]$

$$\begin{aligned}
c. \llbracket \text{Ali ne oynadı?} \rrbracket \ \& \ \llbracket \text{Merve ne oynadı?} \rrbracket \\
&= \lambda C [\sqrt{C} \cup [\bigcup_{x \in \{c, d\}} C + \cdot \varphi_{ax}] \cap [\sqrt{C} \cup \bigcup_{x \in \{c, d\}} C + \cdot \varphi_{mx}]] \\
&= \lambda C [\sqrt{C} \cup [C + \cdot \varphi_{ac} \cup C + \cdot \varphi_{ad}] \cap [C + \cdot \varphi_{mc} \cup C + \cdot \varphi_{md}]] \\
&= \lambda C [\sqrt{C} \cup [C + \cdot \varphi_{ac} \cap C + \cdot \varphi_{mc}] \cup [C + \cdot \varphi_{ac} \cap C + \cdot \varphi_{md}] \cup \\
&\quad [C + \cdot \varphi_{ad} \cap C + \cdot \varphi_{mc}] \cup [C + \cdot \varphi_{ad} \cap C + \cdot \varphi_{md}]]
\end{aligned}$$

The conjoined question leads to a CS which does not change the root but only allows for continuations in which it is established what Ali played, and what Merve played; with cards and domino being the only games, there are four continuations in total. With the update in (106) to an input CS C_0 , we get the output (107)²³:

$$\begin{aligned}
(107) \ C_0 + (106) \\
&= \sqrt{C_0} \cup \{c \in C_0 \mid \{\varphi_{ac}, \varphi_{mc}\} \subseteq c \vee \{\varphi_{ac}, \varphi_{md}\} \subseteq c \vee \\
&\quad \{\varphi_{ad}, \varphi_{mc}\} \subseteq c \vee \{\varphi_{ad}, \varphi_{md}\} \subseteq c\} \\
&= C_1
\end{aligned}$$

Consider now what happens after the assertive update *Ali played cards*:

$$\begin{aligned}
(108) \ C_1 + \cdot \varphi_{ac} \\
&= \{c \in C_0 \mid \{\varphi_{ac}, \varphi_{mc}\} \subseteq c \vee \{\varphi_{ac}, \varphi_{md}\} \subseteq c\} \\
&= \{c \in C_0 \mid \varphi_{ac} \in c \wedge [\varphi_{mc} \in c \vee \varphi_{md} \in c]\}
\end{aligned}$$

In the resulting CS it is established that Ali played cards, and it is either established that Merve played cards or that Merve played domino. This involves an increase in the number of commitment states in the root set: Assume that (107) is a CS with a singleton root, with $\sqrt{(107)} = \{c_0\}$, then (107) + $\cdot \varphi_{ac}$ leads to an output space with a root that contains two elements, $\{c_0 \cup \varphi_{ac} \cup \varphi_{mc}, c_0 \cup \varphi_{ac} \cup \varphi_{md}\}$. This reflects the fact that the other question, ‘what did Merve play?’, remains open after the assertion ‘Ali played cards yesterday’. Only after this question is answered as well, e. g. by ‘Merve played domino’, do we arrive at a CS with a single root again:

$$\begin{aligned}
(109) \ (108) + \cdot \varphi_{md} &= \{c \in C_0 \mid \{\varphi_{ac}, \varphi_{md}\} \subseteq c\}, \\
\text{where } \sqrt{(109)} &= \{\sqrt{C_0} \cup \{\varphi_{ac}, \varphi_{md}\}\}
\end{aligned}$$

²³ The notation $\{\varphi_{ac}, \varphi_{mc}\} \subseteq c$ makes for slightly better readable formulas than $[\varphi_{ac} \in c \wedge \varphi_{mc} \in c]$.

Conjoined questions differ in their interpretation from the multiple constituent question ‘who played what’ in (104). While multiple constituent questions in their “quiz” interpretation (cf. Comorovski 1996) can be completely answered by a single proposition answer, like $\cdot\varphi_{ac}$, such an answer is only a partial answer for conjoined questions. We will discuss this issue in more detail in Section 5.6.

The same conjunctive meaning can arise through universal quantification, which is nothing but generalized conjunction. Following Krifka (2001b), universal quantifiers can scope over question speech acts, expressing a speech act conjunction.²⁴ (111) is an example derivation, assuming that $\{a, m\}$ is the set of children. The quantifier *her çocuk* ‘every child’ scopes out of the speech act as it is interpreted as expressing a generalized Boolean conjunction over CS updates. For some reason, quantifier phrases are more typically used with the aorist in Turkish.

- (110) *Her çocuk ne oynar?*
 every child what play-AOR
 ‘What does every child play?’

- (111) $\llbracket [_{\text{ActP}} [_{\text{DP}} \text{Her çocuk}] \lambda t [_{\text{ActP}} [t \text{ ne oynar}] [_{\text{Act}^0} ?^{wh}]]] \rrbracket$
 $= \llbracket \text{Her çocuk} \rrbracket (\llbracket \lambda t [_{\text{ActP}} [t \text{ ne oynar}] [_{\text{Act}^0} ?^{wh}]] \rrbracket)$
 $= \lambda Q \ \&_{x \in \{a, m\}} [Q(x)] (\lambda x \lambda C [\sqrt{C} \cup [C + \cdot\varphi_{xc}] \cup [C + \cdot\varphi_{xd}]])$
 $= \&_{x \in \{a, m\}} [\lambda C [\sqrt{C} \cup [C + \cdot\varphi_{xc}] \cup [C + \cdot\varphi_{xd}]]]$
 $= \lambda C [\sqrt{C} \cup [C + \cdot\varphi_{ac}] \cup [C + \cdot\varphi_{ad}]] \ \& \ \lambda C [\sqrt{C} \cup [C + \cdot\varphi_{mc}] \cup [C + \cdot\varphi_{md}]]$
 $= \lambda C [\sqrt{C} \cup [[C + \cdot\varphi_{ac}] \cup [C + \cdot\varphi_{ad}]] \cap [[C + \cdot\varphi_{mc}] \cup [C + \cdot\varphi_{md}]]]$
 $= \lambda C [\sqrt{C} \cup C + \cdot\varphi_{ac} + \cdot\varphi_{mc} \cup C + \cdot\varphi_{ac} + \cdot\varphi_{md} \cup C + \cdot\varphi_{ad} + \cdot\varphi_{mc} \cup C + \cdot\varphi_{ad} + \cdot\varphi_{md}]$

²⁴ Krifka (2001b) also argued that disjunctions of speech acts are problematic, predicting that non-universal quantifiers which involve disjunction do not scope into questions (e.g. *What did most children play?* is odd for the wide-scope reading, ‘For most children x , tell me what x played’). In the current framework, we do assume the operation of speech act disjunction $\vee$. Disjunction is problematic for assertions, as updates like $C + [\cdot\varphi \vee \cdot\psi] = C + \cdot\varphi \cup C + \cdot\psi$ lead to multiple roots. This differs from question updates like $C + [?\varphi \vee ?\psi] = \sqrt{C} \cup C + \cdot\varphi \cup C + \cdot\psi$, which preserve the original root $\sqrt{C}$ and hence do not result in root multiplication. We have made use of question disjunction for alternative questions and constituent questions, cf. Sections 4.4 and 4.5. Disjunction of constituent questions is formally possible; for example, *What did Ali play or what did Merve play?* results in the update of C to $\sqrt{C} \cup C + \cdot\varphi_{ac} \cup C + \cdot\varphi_{ad} \cup C + \cdot\varphi_{mc} \cup C + \cdot\varphi_{md}$. Assuming that asking a question comes with the implicature that only one of the proposed continuations is possible, this clashes with the implicature of the individual constituent questions, $\sqrt{C} \cup C + \cdot\varphi_{ac} \cup C + \cdot\varphi_{ad}$ and $\sqrt{C} \cup C + \cdot\varphi_{mc} \cup C + \cdot\varphi_{md}$ that at least one continuation is possible. This may be a structural reason why disjunction of constituent questions, and hence quantification by non-universal quantifiers, is disfavored.

So far, we have discussed the conjunction of constituent questions. We have seen in Section 4.4 that polar questions can be disjoined, leading to alternative questions. Can polar questions be conjoined? Such conjunctions are odd with *-mI* on a focused phrase as in (112), presumably due to the exhaustivity implicature of such questions.

- (112) *Size iki soru soracağım:*
#ALİ_F mi iskambil oynadı, ve MERVE_F mi iskambil oynadı?
 ‘I will ask you two questions:
 #Was it Ali that played cards, and was it Merve that played cards?’

However, they are fine with final *-mI* questions. Recall that polar questions with contrastive topics have final *-mI* (Section 2.5, also see Section 5.4 for a refinement).

- (113) *Ali iskambil oynadı mı, ve Merve iskambil oynadı mı?*

Under the bipolar interpretation derived in (72), the conjunction of the two bipolar questions, whether Ali played cards or not, and whether Merve played cards or not, yields the following interpretation:

- (114) $C + [[?\varphi_{ac} \vee ?\neg\varphi_{ac}] \& [?\varphi_{mc} \vee ?\neg\varphi_{mc}]]$
 $= \sqrt{C} \cup [[C + \cdot\varphi_{ac} \cup C + \cdot\neg\varphi_{ac}] \cap [C + \cdot\varphi_{mc} \cup C + \cdot\neg\varphi_{mc}]]$
 $= \sqrt{C} \cup [[C + \cdot\varphi_{ac} \cap C + \cdot\varphi_{mc}] \cup [C + \cdot\varphi_{ac} \cap C + \cdot\neg\varphi_{mc}] \cup$
 $[C + \cdot\neg\varphi_{ac} \cap C + \cdot\varphi_{mc}] \cup [C + \cdot\neg\varphi_{ac} \cap C + \cdot\neg\varphi_{mc}]]$

This question has four types of continuations: That Ali and Merve played cards, that Ali played cards but Merve did not, that Ali did not play cards but Merve did, and that neither one played cards. An answer that Ali played cards would result in a CS with the remaining question whether Merve played cards:

- (115) (114) + $\cdot\varphi_{ac} = \sqrt{C + \cdot\varphi_{ac}} \cup [C + \cdot\varphi_{mc} \cup C + \cdot\neg\varphi_{mc}]$

Having introduced the notion of conjoined questions we are ready to deal with the role of contrastive topics in assertions, as such assertions are appropriate precisely when a conjoined question is asked.

5.2 Contrastive topic in assertions

Contrastive topics in assertions indicate that the current assertion is not the complete answer to the question under discussion (cf. Krifka 1992; van Kuppevelt 1995; Roberts

1996; Büring 1997, Büring 2003; Kadmon 2001, Kadmon 2009; Yabushita 2008; Gyuris 2009; Tomioka 2010; Constant 2014). It should be said that “contrastive topic” is something of a misnomer, as the term “topic” is predominantly used as the information-structural notion for the expression that refers to the entity the sentence is about, sometimes more narrowly called “aboutness topic” (cf. Jacobs 2001 for clarification of different topic notions). What is called “contrastive topic” is not always a topic; for example, when answering the question how Ali is doing by *Healthwise, he is doing fine*, the adverb *healthwise* is not an aboutness topic (cf. Salfner 2018). For this reason, Krifka (2008) proposed a different term, “delimitation”, that is better suited for the function of this information-structural notion. In the current paper, we will stay with the received term “contrastive topic”, for this notion.

To illustrate, consider examples (116), where we assume that Ali and Merve are the siblings of S_2 .

- (116) S_1 : a. *Ali ve Merve ne oynadı?*
 Ali and Merve what play-PAST
 ‘What did Ali and Merve play?’
 b. *Kardeş-lerin ne oynadı?*
 sibling-PLUR what play-PAST
 ‘What did your siblings play?’

S_2 : *ALİ_C İSKAMBİL_F oynadı ve MERVE_C DOMİNO_F oynadı.*
 ‘Ali played cards, and Merve played domino.’

The questions (116)(a,b) cannot be answered appropriately with a simple proposition, as Ali and Merve played different things. For this reason, they are split into two subquestions, ‘what did Ali play?’ and ‘what did Merve play?’, which are answered separately. We take it that contrastive topics in answers indicate that there is such a conjoined question in the context, where the conjuncts require separate answers. In the case at hand, in the first clause of S_2 ’s answer, contrast on *Ali* (marked by C) indicates that there are alternative questions (here, the question about Merve), and focus on *iskambil* (marked by F) indicates the answer alternatives of the question.

Notice that the contrastive topic clause (116)(S_2) answers a conjoined question. We take this to be essential for contrastive topics: They indicate that a conjoined question is asked, explicitly as in (116) by splitting up a question into conjoined subquestions. An assertion with contrastive topic may also accommodate such a question in a suitable situation (cf. Section 5.5). Asking a conjoined question means that an answer to any question conjunct should be appropriate, because it constitutes a (partial) answer to the conjoined question.

The task now is to identify a meaning for assertions with contrastive topic that predicts that they can occur precisely in those CSs in which an appropriate conjoined question is asked. For this, we first have to be clear about how contrastive topics should be modeled. Consider the following example, the first clause of S_2 's answer in (116).

(117) $ALI_C \dot{ISKAMBİL}_F oynadı.$

This contains a focus that projects alternatives, and a contrastive topic that projects alternatives as well. These two alternative sets do not combine as in the case of multiple focus like in (100); rather, they are used by different operators. This requires a semantic representation that can handle the contribution of focus and of contrastive topic independently. There are different proposals to represent these two distinct uses of alternatives.²⁵ We follow here Constant (2014), who argued, following Tomioka (2010) and Wagner (2012), that contrastive topics are moved into a position from which their alternatives can be exploited by a dedicated contrastive topic operator (cf. also Kadmon 2009). If you recall, Turkish presents independent evidence for a similar kind of overt topic movement (cf. Section 2.1).

One implementation of this idea is that (117) results in the following syntactic structure, involving a FocP, cf. (61), with a FS head that interprets the focus, and a CTP phrase with a head CT that interprets the contrastive topic.

(118) $[_{CTP} [_{DP} ALI_C] \lambda t[_{FocP} [_{ActP} [t \dot{ISKAMBİL}_F oynadı] [_{Act^o} \cdot]] [_{Foc^o} FS]][_{CT^o} CT]]$

How is this structure interpreted? For the alternative semantics approach of Büring (1997, 2003, 2014) and Constant (2014), the structure (118) leads to a non-ordinary meaning, the CT meaning, that is a set of questions sorted after the alternatives of Ali – here, the set $\{\{\varphi_{ac}, \varphi_{ad}\}, \{\varphi_{mc}, \varphi_{md}\}\}$. Notice that this meaning is of a higher type, sets of sets of propositions, than with assertions that have a simple focus, sets of propositions. In the current theory, there is no such type difference; all speech acts are functions from input CS to output CS. But focus and contrastive topic should both express their own requirement on

²⁵ A proposal that does not assume movement of contrastive topics but works with nested structured meanings was suggested in Krifka (1992). A representation without movement in alternative semantics was developed by Büring (1997, 2003), who proposed that contrastive topics induce another layer of alternative formation, resulting in sets of sets of propositions, cf. (7).

the input CS, namely that a conjoined question ‘What did Ali play and what did Merve play?’ is asked.

In a first step, we assume that the CT operator is applied to the contrastive topic and the constituent from which the contrastive topic is moved out:

$$(119) \quad \llbracket (118) \rrbracket = \llbracket \text{CT} \rrbracket (\llbracket [\text{DP } ALI_C] \rrbracket, \llbracket \lambda t_{[\text{FOCP}]} [\text{ActP } [\text{TP } t \text{ İSKAMBİL}_F \text{ oynadı}] [\text{Act}^\circ \cdot]]_{[\text{FOC}^\circ \text{ FS}]]} \rrbracket)$$

The background argument $\llbracket \lambda t_{[\text{FOCP}]} \rrbracket$ in (119) is interpreted as a function from entities to assertive updates. Following conventions of trace interpretation of Heim and Kratzer (1998), this is done as in (120), where $t:x$ indicates that the trace t is interpreted as the variable x . We assume that the focus within the ActP is interpreted by the basic FS operator, cf. (57).

$$(120) \quad \begin{aligned} & \llbracket \lambda t_{[\text{FOCP}]} [\text{ActP } [\text{TP } t \text{ İSKAMBİL}_F \text{ oynadı}] [\text{Act}^\circ \cdot]]_{[\text{FOC}^\circ \text{ FS}]]} \rrbracket \\ \text{a.} &= \lambda x [\llbracket [\text{FOCP} [\text{ActP } [\text{TP } t \text{ İSKAMBİL}_F \text{ oynadı}] [\text{Act}^\circ \cdot]]_{[\text{FOC}^\circ \text{ FS}]]} \rrbracket^{t:x}] \\ \text{b.} &= \lambda x [\llbracket [\text{FOC}^\circ \text{ FS}] \rrbracket (\llbracket [\text{ActP } [\text{TP } t \text{ İSKAMBİL}_F \text{ oynadı}] [\text{Act}^\circ \cdot]] \rrbracket^{t:x})] \\ \text{c.} &= \lambda x [\text{FS}(\llbracket [\text{Act}^\circ \cdot] \rrbracket (\llbracket [\text{TP } t \text{ İSKAMBİL}_F \text{ oynadı}] \rrbracket^{t:x}))] \\ \text{d.} &= \lambda x [\text{FS}(\langle \lambda y [\cdot \varphi_{xy}] \text{ c, } \{c, d\} \rangle)] \\ \text{e.} &= \lambda x \lambda C \frac{C = \sqrt{C} \cup C + \cdot \varphi_{xc} \cup C + \cdot \varphi_{xd}}{C + \cdot \varphi_{xc}} \end{aligned}$$

The result is a function from entities x into a CS update function. We now turn to the contribution of the contrastive topic. We assume that $[\text{DP } ALI_C]$ is interpreted as a contrastive topic-alternative structure $\langle c, A \rangle$, in the case at hand as $\langle a, \{a, m\} \rangle$, assuming that Merve is the only alternative to Ali. The CT operator takes this structure $\langle a, \{a, m\} \rangle$ and the background (120) as arguments, by which (119) is spelled out as (121):

$$(121) \quad \text{CT}(\langle a, \{a, m\} \rangle, \lambda x \lambda C \frac{C = \sqrt{C} \cup C + \cdot \varphi_{xc} \cup C + \cdot \varphi_{xd}}{C + \cdot \varphi_{xc}})$$

This is the general format of interpretation of the CT operator. We now turn to its meaning. As argued above, it should express the requirement that each contrastive topic alternative forms a well-formed contribution to the input CS C . This is equivalent to asking that the *conjunction* of all the requirements for the contrastive topic alternatives hold for C . We propose the following interpretation:

$$(122) \quad \text{CT}(\langle c, A \rangle, B) = \lambda C \frac{C = \text{the smallest } C' \text{ s.t. } [C' \supseteq \bigcap_{x \in A} B(x)(C)]}{B(c)(C)}$$

This states that input CS C must satisfy the requirement that it contains the intersection (the conjunction) of all the updates by the topic alternatives. In addition, C should be the smallest such CS.

To see how CT works, consider its effect on our example. As the background B also expresses conditions for the input CS, the result appears fairly complex at first:

$$(123) \quad (121) = \lambda C \frac{C = \text{the smallest } C' \left[\begin{array}{c} C' \supseteq \bigcap_{x \in \{a, m\}} \frac{C = \sqrt{C} \cup C + \varphi_{xc} \cup C + \varphi_{xd}}{C + \varphi_{xc}} \\ C = \sqrt{C} \cup C + \varphi_{ac} \cup C + \varphi_{ad} \\ C + \varphi_{ac} \end{array} \right]}{C = \text{the smallest } C' \left[\begin{array}{c} C' \supseteq \left[\frac{C = \sqrt{C} \cup C + \varphi_{ac} \cup C + \varphi_{ad}}{C + \varphi_{ac}} \cap \frac{C = \sqrt{C} \cup C + \varphi_{mc} \cup C + \varphi_{md}}{C + \varphi_{mc}} \right] \\ C = \sqrt{C} \cup C + \varphi_{ac} \cup C + \varphi_{ad} \\ C + \varphi_{ac} \end{array} \right]} = \lambda C$$

We will walk through this representation. The overall effect is given in the bottom line, $C + \cdot \varphi_{ac}$: The input CS C is updated so that it contains the proposition that Ali played cards. But this only holds if C satisfies a number of conditions, in particular the following:

- (124) a. $C = \sqrt{C} \cup C + \cdot \varphi_{ac} \cup C + \cdot \varphi_{ad}$ (occurs twice)
 b. $C = \sqrt{C} \cup C + \cdot \varphi_{mc} \cup C + \cdot \varphi_{md}$
 c. $C = \text{the smallest } C' \text{ such that } C' \supseteq C + \cdot \varphi_{ac} \cap C + \cdot \varphi_{mc}$

Let us assume the input context C_1 after the conjoined question ‘What did Ali play? And what did Merve play?’ in (107), repeated here:

$$(125) \quad C_1 = \sqrt{C_0} \cup \{c \in C_0 \mid \{\varphi_{ac}, \varphi_{mc}\} \subseteq c \vee \{\varphi_{ac}, \varphi_{md}\} \subseteq c \vee \{\varphi_{ad}, \varphi_{mc}\} \subseteq c \vee \{\varphi_{ad}, \varphi_{md}\} \subseteq c\}$$

The following updates of C_1 play a role for checking the conditions in (124):

- (126) a. $C_1 + \varphi_{ac} = \{c \in C_0 \mid \{\varphi_{ac}, \varphi_{mc}\} \subseteq c \vee \{\varphi_{ac}, \varphi_{md}\} \subseteq c\}$
 b. $C_1 + \varphi_{ad} = \{c \in C_0 \mid \{\varphi_{ad}, \varphi_{mc}\} \subseteq c \vee \{\varphi_{ad}, \varphi_{md}\} \subseteq c\}$
 c. $C_1 + \varphi_{mc} = \{c \in C_0 \mid \{\varphi_{ac}, \varphi_{mc}\} \subseteq c \vee \{\varphi_{ad}, \varphi_{mc}\} \subseteq c\}$
 d. $C_1 + \varphi_{md} = \{c \in C_0 \mid \{\varphi_{ac}, \varphi_{md}\} \subseteq c \vee \{\varphi_{ad}, \varphi_{md}\} \subseteq c\}$

It turns out that the three conditions in (124) indeed all hold for $C = C_1$. Condition (124)(a) holds, as $C_1 = \sqrt{C_1} \cup C_1 + \cdot \varphi_{ac} \cup C_1 + \cdot \varphi_{ad}$. Condition (b) holds as well, as $C_1 = \sqrt{C_1} \cup C_1 + \cdot \varphi_{mc} \cup C_1 + \cdot \varphi_{md}$. Furthermore, it also holds that $C_1 \supseteq C_1 + \cdot \varphi_{ac} \cap C_1 + \cdot \varphi_{mc}$: Notice that $C_1 + \cdot \varphi_{ac} \cap C_1 + \cdot \varphi_{mc}$ equals $\{c \in C_0 \mid \{\varphi_{ac}, \varphi_{mc}\} \subseteq c\}$, which is a subset of C_1 . Due to the constraints expressed by conditions (126)(a) and (b), C_1 is the smallest CS for which all conditions hold.

(The role of invoking the smallest condition will become clear when we consider contrastive topics in questions.)

As the conditions are all satisfied, (123) can be applied to C_1 , resulting in the following CS:

$$(127) \quad C_1 + (123) = C_1 + \cdot \varphi_{ac} = \{c \in C_0 \mid \varphi_{ac} \in c \wedge [\varphi_{mc} \in c \vee \varphi_{md} \in c]\} = C_2$$

The resulting CS C_2 has a root with two elements (provided that C_0 was single-rooted), reflecting the fact that the information requested by C_1 is not fully answered yet; the information what Merve played is still requested:

$$(128) \quad \sqrt{C_2} = \sqrt{C_0 + \cdot \varphi_{ac} + \cdot \varphi_{mc}} \cup \sqrt{C_0 + \cdot \varphi_{ac} + \cdot \varphi_{md}}$$

We have seen that the operator CT imposes a restriction on input CSs that can be satisfied by a conjoined constituent question. In case of a CS C_0 that does not come with any specific restriction, the update by (123) is not acceptable, as the restrictions (124)(a) and (b) would not hold:

$$(129) \quad \begin{array}{l} \text{a. } C_0 \neq \sqrt{C_0} \cup C_0 + \cdot \varphi_{ac} \cup C_0 + \cdot \varphi_{ad} \\ \text{b. } C_0 \neq \sqrt{C_0} \cup C_0 + \cdot \varphi_{mc} \cup C_0 + \cdot \varphi_{md} \end{array}$$

In case C_0 is updated by a single question like ‘What did Ali play?’, the contrastive topic assertion is not acceptable either. This question would result in the following CS C_3 :

$$(130) \quad C_3 = \sqrt{C_0} \cup \{c \in C_0 \mid \varphi_{ac} \in c \vee \varphi_{ad} \in c\}$$

This CS does not satisfy the requirement of (124). In particular, while the condition corresponding to (126)(a) is satisfied for C_3 , the condition corresponding to (b) is not:

$$(131) \quad \begin{array}{l} \text{a. } C_3 = \sqrt{C_3} \cup C_3 + \cdot \varphi_{ac} \cup C_3 + \cdot \varphi_{ad} \\ \text{b. } C_3 \neq \sqrt{C_3} \cup C_3 + \cdot \varphi_{mc} \cup C_3 + \cdot \varphi_{md} \end{array}$$

This concludes our argument that the interpretation of the CT operator as in (122) indeed expresses a restriction on the input CS which reflects the condition that assertions with contrastive topic are answers to subquestions of a conjunctive question. The near-obligatory use of contrastive topic in such cases can be explained by the pragmatics of informativity, in this case, of maximizing

presupposition: If the context satisfies the requirement of a contrastive topic assertion, this form should be used.

In the examples with contrastive topic considered so far, we also have a focus; in fact, it appears that contrastive topic without an additive particle like *too* is licensed only if an assertion also contains a focus, a point made by Szabolcsi (1981) and Gyuris (2009) for Hungarian and Büring (1997) for German.²⁶ However, Büring (2003: 532 f.) and Constant (2014: 41 f.) have claimed that assertions with focusless CTs exist, with examples like *Can Jack and Bill come to tea?* – *BILL_C can.*²⁷ However, these examples arguably have a polarity focus expressed on the finite auxiliary verb; in German, such cases would be expressed with the particle *schon* that attracts verum focus accent, as in *BILL_C kann SCHON_F*. So the available evidence rather indicates that contrastive topics need an additional focus.

Our representation explains why this is so as follows. Consider the hypothetical case of an assertion with contrastive topic but no focus, as in (132)(a). Contrastive topic would yield the structure and interpretation (b), following the interpretation of CT in (122).

- (132) a. *ALI_C iskambil oynadı.*
 b. $\text{CT}(\langle a, \{a, m\} \rangle, \lambda x \lambda C [C + \cdot \varphi_{xc}])$
 $= \lambda C \frac{C = \text{the smallest } C' \supseteq [C + \cdot \varphi_{ac} \cap C + \cdot \varphi_{mc}]]}{C + \cdot \varphi_{ac}}$

Due to the conjunctive intersection on the upper line, it is already established in the input *C* that Ali played cards. But then the instruction on the lower line, to update *C* with that very proposition, is redundant. It is well known that systematic redundancy leads to unacceptability (cf. Abrusán 2019).

Assertions with contrastive topics often are combined with similar assertions with contrastive topics, as in (116). The reason is that contrastive topics indicate alternative answers, that is, the conjoined context question is not completely answered yet (cf. Büring 1997). For example, after hearing (117) one is still interested in what Merve played, and hence expects a second assertion like (133):

- (133) *MERVE_C DOMİNO_F oynadı.*

Now, a known problem (cf. Büring 2003; Constant 2014) is the following. Just before the last answer that finishes a series of contrastive topic assertions, there is

²⁶ In case of contrastive topics with *too*, arguably the additive particle *too* carries focus, indicating the alternative exhaustive particle *only* (cf. Krifka 1999).

²⁷ Cf. also Tomioka (2010) for contrastive topics without focus in Japanese.

only one remaining question that is asked. For example, at the position where *MERVE_C DOMİNO_F oynadı* in (116) is interpreted, the input CS is $\{c \in C_0 \mid \varphi_{ac} \in c \wedge \{\varphi_{mc}, \varphi_{md}\} \subseteq c\}$, as it is established at this point that Ali played cards, and the possible continuations contain either the proposition that Merve played cards, or that Merve played domino. This is a CS in which only a single constituent question, ‘What did Merve play?’, is asked. And as we have seen with (130), in cases in which only a single question is asked, contrastive topic is not acceptable.

One option to deal with the problem of the completing answer is that the set of alternatives of the contrastive topic reduces with each answer by the contrastive topic of this answer. The final answer then is a degenerate case of contrastive topic, as the set of alternatives is a singleton; in this situation, *MERVE_C* would be interpreted as $\langle m, \{m\} \rangle$. The requirement of the contrastive topic is trivially satisfied, as there are no other alternatives.

Another option is to make use of the discourse memory that is available in the current framework due to the use of CS developments, cf. (40). An assertion with a contrastive topic can be interpreted at the most salient last CS of a CS development, as in (134)(b), where *C₁* satisfies the requirement, resulting in the final CS *C₂*. If this is not possible, it can also be interpreted at a less salient preceding CS that satisfies the requirements, as in (134)(c), where the assertion is interpreted at a preceding input CS, *C₁*, but added to the last CS, *C₂*.

- (134) a. $\langle \dots, C_0 \rangle + \llbracket \text{Ali ve Merve ne oynadı?} \rrbracket = \langle \dots, C_0, C_1 \rangle$
 b. $\langle \dots, C_0, C_1 \rangle + \llbracket \text{ALİC İSKAMBİL_F oynadı.} \rrbracket$
 $= \langle \dots, C_0, C_1, C_2, C_2 \cap C_1 + \llbracket \text{MERVE_C DOMİNO_F oynadı.} \rrbracket \rangle = \langle \dots, C_0, C_1, C_2, \rangle$
 c. $\langle \dots, C_0, C_1 \rangle + \llbracket \text{MERVE_C DOMİNO_F oynadı.} \rrbracket$
 $= \langle \dots, C_0, C_1, C_2, C_2 \cap C_1 + \llbracket \text{MERVE_C DOMİNO_F oynadı.} \rrbracket \rangle$

Under this analysis, contrastive topic can pick up an accessible salient CS in discourse that matches its input requirement.

The representation format is flexible enough to allow for the case of multiple contrastive topics, as in *On FRIDAY_C ALİC played CARDS_F*. Take φ_{acf} as the proposition that Ali played cards on Friday, and take Saturday (s) to be the only alternative to Friday. We can assume that double contrastive topic leads to pairing of variables, cf. (135)(a), just as with double focus (cf. (100). Alternatively, one contrastive topic can also take scope over another, cf. (135)(b).

- (135) a. $CT(\langle a, f \rangle, \{a, m\} \times \{f, s\}) \left(\lambda \langle x, y \rangle \lambda C \frac{C = \sqrt{C} \cup C + \cdot \varphi_{xcy} \cup C + \cdot \varphi_{xdy}}{C + \cdot \varphi_{xcy}} \right)$
 b. $CT(f, \{f, s\}, \lambda y \left[CT(a, \{a, m\}, \lambda x \lambda C \frac{C = \sqrt{C} \cup C + \cdot \varphi_{xcy} \cup C + \cdot \varphi_{xdy}}{C + \cdot \varphi_{xcy}}) \right])$

Both representations turn out to be equally expressive, as scope differences in the representation format (135)(b) do not matter. This may not be easy to see in the rather complex formula that results when (135) is spelled out (not given here), but recall that contrastive topic indicates the presence of a conjoined question. The context question expected by (135)(b) is rendered by (136)(a).

- (136) a. $[[\varphi_{acf} \vee \varphi_{adf}] \& [\varphi_{mcf} \vee \varphi_{mdf}]] \& [[\varphi_{acs} \vee \varphi_{ads}] \& [\varphi_{mcs} \vee \varphi_{mds}]]$
 b. $[[\varphi_{acf} \vee \varphi_{adf}] \& [\varphi_{acs} \vee \varphi_{ads}]] \& [[\varphi_{mcf} \vee \varphi_{mdf}] \& [\varphi_{mcs} \vee \varphi_{mds}]]$

But due to associativity of $\&$, (136)(a) is equivalent to (b), corresponding to the case in which one contrastive topic scopes over another, cf. (135)(b). Hence the assumption of parallel processing and of scopal processing of multiple CTs does not make any empirical differences, as far as the semantic interpretation at this level is concerned.

5.3 Contrastive topic in polar questions

In the last section, we have discussed how contrastive topics work for assertions. We now turn to contrastive topics in questions. Some theoretical accounts are known to have problems with the extension of contrastive topics to questions (cf. Büring 2003, as discussed by Constant 2014). Other theories do not consider contrastive topics in questions, for example Gyuris (2009) and Kadmon (2001, 2009), who deal only with foci in questions, possibly overlooking the possibility due to intonation (cf. Section 4.6). Constant (2014) proposes a theory of contrastive topics in questions, and his notion of Generalized CT congruence (p. 69 f.) is very similar for assertions and questions.

The CT operator in (122) does give the expected results for both assertions and questions, and does this for polar questions as well as for constituent questions. In the assertion case, contrastive topic indicates that alternative assertions could have been made because the underlying question is complex, a conjoined question. In the case of questions, contrastive topic indicates that alternative questions could have been asked, also because there is a complex underlying question.

As an example, consider the following contrastive topic in a polar question, cf. (25)(b). We have shown in Section 2.4 how these polar questions are systematically differentiated from polar questions with focus, including their failure to have *-mI* on the accented element, rising boundary tone, and anti-exhaustivity effects.

(137) ALI_C *iskambil oynadı mı?*

We assumed the following derivation of a final *-mI* question as a question that presupposes a bipolar question, as proposed in (72) and (73):

$$(138) \text{FS}(\llbracket_{\text{ActP}} [\text{PolP} [\text{TP} ALI_C \text{iskambil oynadı}] [\text{Pol}^\circ \text{POS}]_F \text{mI}] [\text{Act}^\circ?] \rrbracket]) \\ = \lambda C \frac{C = \sqrt{C} \cup C + \cdot \varphi_{ac} \cup C + \cdot \neg \varphi_{ac}}{\sqrt{C} \cup C + \cdot \varphi_{ac}}$$

In case *Ali* is a contrastive topic, it is moved out of the TP, leaving a trace, and interpreted by a CT operator, just as with assertions that contain a contrastive topic, illustrated in (139).

$$(139) \text{a. } \llbracket_{\text{CTP}} [ALI_C] \lambda t [\text{FocP} [\text{ActP} [\text{PolP} [\text{TP} t \text{iskambil oynadı}] [\text{Pol}^\circ \text{POS}]_F \text{mI}] [\text{Act}^\circ?] \rrbracket] \\ [\text{Foc}^\circ \text{FS}]] [\text{CT}^\circ \text{CT}]] \rrbracket \\ \text{b. } = \text{CT}(\llbracket_{\text{CTP}} [ALI_C], \lambda x \text{FS}(\llbracket_{\text{FocP}} [\text{PolP} [\text{TP} t \text{iskambil oynadı}] [\text{Pol}^\circ \text{POS}]_F \text{mI}] [\text{Act}^\circ?] \rrbracket] \\ [\text{Foc}^\circ \text{FS}]]^{t:x}) \rrbracket \\ \text{c. } = \text{CT}(\langle a, \{a, m\} \rangle, \lambda x \lambda C \frac{C = \sqrt{C} \cup C + \cdot \varphi_{xc} \cup C + \cdot \neg \varphi_{xc}}{\sqrt{C} \cup C + \cdot \varphi_{xc}}) \\ \text{d. } = \lambda C \frac{C = \text{the smallest } C' \left[C' \supseteq \bigcap_{x \in \{a, m\}} \frac{C = \sqrt{C} \cup C + \cdot \varphi_{xc} \cup C + \cdot \neg \varphi_{xc}}{\sqrt{C} \cup C + \cdot \varphi_{xc}} \right]}{\frac{C = \sqrt{C} \cup C + \cdot \varphi_{ac} \cup C + \cdot \neg \varphi_{ac}}{\sqrt{C} \cup C + \cdot \varphi_{ac}}} \\ \text{e. } = \lambda C \frac{C = \text{the smallest } C' \left[C' \supseteq \left[\frac{C = \sqrt{C} \cup C + \cdot \varphi_{ac} \cup C + \cdot \neg \varphi_{ac}}{\sqrt{C} \cup C + \cdot \varphi_{ac}} \cap \frac{C = \sqrt{C} \cup C + \cdot \varphi_{mc} \cup C + \cdot \neg \varphi_{mc}}{\sqrt{C} \cup C + \cdot \varphi_{mc}} \right] \right]}{\frac{C = \sqrt{C} \cup C + \cdot \varphi_{ac} \cup C + \cdot \neg \varphi_{ac}}{\sqrt{C} \cup C + \cdot \varphi_{ac}}}$$

The net effect can again be found in the bottom line of (139)(e): In the output CS, the question if Ali played cards is asked, $\sqrt{C} \cup C + \cdot \varphi_{ac}$. The condition above that line, $C = \sqrt{C} \cup C + \cdot \varphi_{ac} \cup C + \cdot \neg \varphi_{ac}$, states that in the input C, the bipolar question whether Ali played cards or not is asked. This condition on C is also imposed by the upper line on the left side of the intersection. On the right side, an additional condition is imposed, $C = \sqrt{C} \cup C + \cdot \varphi_{mc} \cup C + \cdot \neg \varphi_{mc}$, which states that the bipolar question whether Merve played cards or not is asked. Furthermore, C must also satisfy the condition $C \supseteq \sqrt{C} \cup [C + \cdot \varphi_{ac} \cap C + \cdot \varphi_{mc}]$, that is, the monopolar questions if Ali played cards, and if Merve played cards, are asked. In addition, C should be the minimal input commitment space that satisfies all these requirements.

Taken together, these conditions amount to the requirement that for a proper input CS C, the conjunction of the bipolar questions whether Ali played cards or not, and whether Merve played cards or not, are asked. No additional continuations beyond these bipolar questions about the alternatives of the contrastive topic are allowed. This is the commitment expressed in (114). Hence, the current representation makes the prediction that a question like

(137) requires a context question of the type *Did Ali play cards or not, and did Merve play cards or not?*

To see how such questions work in the CS development, assume that an input C_0 is updated by (114), ‘Did Ali play cards, and did Merve play cards?’, resulting in C_4 :

$$(140) \quad C_0 + (114) = \sqrt{C_0} \cup \{c \in C_0 \mid \{\varphi_{ac}, \varphi_{mc}\} \subseteq c \vee \{\varphi_{ac}, \neg\varphi_{mc}\} \subseteq c \vee \{\neg\varphi_{ac}, \varphi_{mc}\} \subseteq c \vee \{\neg\varphi_{ac}, \neg\varphi_{mc}\} \subseteq c\} = C_4$$

C_4 satisfies the requirements of (139): Applying the CT question (139) to C_4 , we get as output C_5 , in which the monopolar question if Ali played cards is asked, and the bipolar question whether Merve played cards or not.

$$(141) \quad C_4 + (139) = \sqrt{C_0} \cup \{c \in C_0 \mid \{\varphi_{ac}, \varphi_{mc}\} \subseteq c \vee \{\varphi_{ac}, \neg\varphi_{md}\} \subseteq c\} = C_5$$

The answer *evet* ‘yes’ asserts the proposition φ_{ac} and leads to an output CS C_6 in which the proposition φ_{ac} is established but the background question whether Merve played cards or not is still being asked:

$$(142) \quad C_5 + \cdot\varphi_{ac} = \{c \in [C_0 + \cdot\varphi_{ac}] \mid \varphi_{mc} \in c \vee \neg\varphi_{md} \in c\} = C_6$$

The answer *hayır* ‘no’, requires a retraction $\Re$ at the point (141) in the CS development, leading back to C_4 , at which point the negated proposition $\neg\varphi_{ac}$ is asserted. As before, the question whether Merve played cards or not remains. Notice that there is no formal problem with the combination of a monopolar and a bipolar question as in (141).

$$(143) \quad C_4 + \cdot\neg\varphi_{ac} = \{c \in [C_0 + \cdot\neg\varphi_{ac}] \mid \{\varphi_{mc}\} \subseteq c \vee \{\neg\varphi_{md}\} \subseteq c\}$$

5.4 Contrastive topic in constituent questions

We now turn to contrastive topics in constituent questions. As discussed in Section 4.6, constituent questions do not allow for an additional focus marking indicated by *-mI* because the meaning contribution of focus and the meaning contribution of a wh-constituent are not compatible with each other. However, as shown in Section 2.5, constituent questions do allow for contrastive topics, as in (144), which can be asked in a context in which there is a conjoined question what Ali played and what Merve played:

- (144) ALI_C *ne oynadı?*
 ‘As for ALI_C , what did HE_C play?’

The alternatives arising from the contrastive topic ALI_C do not interfere with the alternatives introduced by the wh-constituent *ne*, as the contrastive topic moves out of the domain in which focus is interpreted. We get the following interpretation, where $\{c, d\}$ is the set of games that *ne* ‘what’ targets.

$$(145) \quad \llbracket_{[ActP] Ali\ ne\ oynadı?} \rrbracket = \lambda C[\sqrt{C} \cup C + \cdot \varphi_{ac} \cup C + \cdot \varphi_{ad}]$$

Contrastive topic results in the following meaning, with $\{a, m\}$ as topic alternatives.

$$(146) \quad \begin{aligned} \text{a. } & \llbracket_{[CTP] [ALI_C] [ActP] [t\ ne\ oynadı] [Act^o \cdot ?^{wh}] [CT^o\ CT]} \rrbracket \\ \text{b. } & = CT(\langle a, \{a, m\} \rangle, \lambda x \llbracket_{[ActP] [t_x\ ne\ oynadı] [Act^o \cdot ?^{wh}]} \rrbracket) \\ \text{c. } & = CT(\langle a, \{a, m\} \rangle, \lambda x \lambda C[\cup C + \cdot \varphi_{xc} \cup C + \cdot \varphi_{xd}]) \\ \text{d. } & = \lambda C \frac{C = \text{the smallest } C' [C' \supseteq [\sqrt{C'} \cup C' + \cdot \varphi_{ac} \cup C' + \cdot \varphi_{ad}] \cap [\sqrt{C'} \cup C' + \cdot \varphi_{mc} \cup C' + \cdot \varphi_{md}]]}{[\sqrt{C} \cup C + \cdot \varphi_{ac} \cup C + \cdot \varphi_{ad}]} \end{aligned}$$

This imposes the restriction on the input CS that exactly the questions ‘What did Ali play?’ and ‘What did Merve play?’ are asked, that is, a CS after the question (106), which was exemplified in (107). This in turn means that the propositions of these questions – here, that Ali played cards or that Ali played domino, and that Merve played cards or that Merve played domino – are the only continuations.

A natural answer to a constituent question with contrastive topic would be an assertion with a contrastive topic and a focus that corresponds to the constituent question word, such as ALI_C $\dot{I}SKAMBİL_F$ *oynadı*. The condition on the input CS that is expressed by this answer is met after asking the question (146). With this question, the question of what Merve played remains in the CS, which, as with assertions and polar questions with contrastive topic, arises due to the underlying conjoined question.

We would like to briefly discuss how the problem of the completing answer observed for assertions (133) arises in questions, as in our analysis, contrastive topic in a question indicates an underlying conjoined question just like in an assertion. For example, after the update of C_0 with the question (114), ‘Did Ali play cards and did Merve play cards?’, the polar question (139), ‘Did ALI_C play cards?’ is appropriate because the other possible question, whether Merve played cards, is also asked. After an appropriate answer (e. g., by *evet* ‘yes’) the only question left would be whether Merve played cards, provided that Merve is the only alternative

to Ali. However, this does not predict that we find contrastive topic marking in the second question ‘Did MERVE_C play cards?’ We can deal with this case in a similar fashion as with assertions, cf. (134), namely that the question is interpreted at a preceding CS. Notice that the contrastive topic question is interpreted at the position C₄, where the conjoined question is asked.

- (147) a. $\langle \dots, C_0 \rangle + (114) \text{ ‘Did Ali play cards and did Merve play cards?’} = \langle \dots, C_0, C_4 \rangle$
 b. $\langle \dots, C_0, C_4 \rangle + (139) \text{ ‘Did ALI_C play cards?’} = \langle \dots, C_0, C_4, C_5 \rangle$
 c. $\langle \dots, C_0, C_4, C_5 \rangle + \text{‘Yes.’} = \langle \dots, C_0, C_4, C_5, C_6 \rangle$
 d. $\langle \dots, C_0, C_4, C_5, C_6 \rangle + \text{‘Did MERVE_C play cards?’}$
 $= \langle \dots, C_0, C_4, C_5, C_6, C_6 \cap C_4 + \text{‘Did MERVE_C play cards?’} \rangle$

When we look at how contrastive topics are typically used in conversation, we find that assertions and questions differ in terms of their marking of contrastive topic in a series of sister utterances like in these scenarios. In assertions, contrastive topic typically indicates that more assertions on the same matter will appear. In contrast, in questions, contrastive topic is often used when one or more questions on the same matter have already appeared. While the last assertion to a conjoined question can also be realized without contrastive topic, the last (or perhaps any non-initial) subquestion is rather required to mark a contrastive topic, which makes an operation along the lines presented here more crucial for questions than assertions.

- (148) S₁: *Ali ne oynadı?*
 ‘What did Ali play?’
 S₂: *Ali İSKAMBİL_F oynadı.*
 ‘Ali played CARDS.’
 S₁: *(Peki) MERVE_C ne oynadı? /#Peki Merve ne oynadı?*
 (And) what did MERVE play? /#And what did Merve play?

We suggest that this pattern arises as follows: At the point of the first question of S₁, there is no contrastive topic, and hence no indication of a conjoined question. At the point of the second question of S₁, one question has already been asked, and answered. Contrastive topic indicates this more general conjoined question (‘What did Ali play, and what did Merve play?’), of which one question already appeared. The difference between assertions and questions as to the presence of contrastive topic marking may be due to the fact that explicit question–answer pairs are frequent, and so there are many cases in which contrastive topic in an answer is used to express congruence with an explicit conjoined question. Explicit question–subquestion pairs are presumably more rare, and therefore more often

constructed on the fly in the course of conversation, relying on explicit marking. This difference does not affect our basic finding that both CT assertions and CT questions are felicitous after a conjoined question.

We have discussed contrastive topics in polar questions with final *-mI* in (139) and contrastive topics in constituent questions in (146). We close these sections on contrastive topic in questions with a slightly surprising feature of the empirical paradigm in Turkish. While polar questions with contrastive topic are perfectly fine with final *-mI*, cases where *-mI* is attached to some focused phrase are rather marked and infrequent, if not unacceptable. One such example and how it would be interpreted in the current theory is given in (149).

- (149) a. $ALI_C \text{ İSKAMBİL}_F \text{ mi oynadı?}$ ‘How about Ali? Did HE_C play CARDS_F?’²⁸
 b. $\llbracket_{[CTP]} [ALI_C]_{[FOCP]} [ActP] [t \text{ İSKAMBİL}_F \text{ mi oynadı}]_{[Act^o?]} \rrbracket_{[FOC^o \text{ FS}]} \llbracket_{[CT^o \text{ CT}]} \rrbracket \rrbracket$
 c. $= CT(\llbracket ALI_C \rrbracket, \lambda x \text{ FS}(\llbracket [FOCP] [ActP] [TP \text{ t İSKAMBİL}_F \text{ mi oynadı}]_{[Act^o \text{ ?}^{wh}]} \rrbracket_{[FOC^o \text{ FS}]} \rrbracket^{t:x}))$
 d. $= CT(\langle m, \{m, e\} \rangle, \lambda x \lambda C \left[\frac{C = \sqrt{C} \cup C + \varphi_{xc} \cup C + \varphi_{xd}}{\sqrt{C} \cup C + \varphi_{xc}} \right])$
 e. $= \lambda C \frac{C = \text{the smallest } C' \left[C' \supseteq \left[\frac{C = \sqrt{C} \cup C + \varphi_{ac} \cup C + \varphi_{ad}}{\sqrt{C} \cup C + \varphi_{ac}} \cap \frac{C = \sqrt{C} \cup C + \varphi_{mc} \cup C + \varphi_{md}}{\sqrt{C} \cup C + \varphi_{mc}} \right] \right]}{\frac{C = \sqrt{C} \cup C + \varphi_{ac} \cup C + \varphi_{ad}}{\sqrt{C} \cup C + \varphi_{ac}}}$

This asks the monopolar question if Ali played cards (last line), where in the input CS the disjunctive questions if Ali played cards or domino and if Merve played cards or domino are asked. This appears to be a plausible background question; in fact it is the same as the constituent question $ALI_C \text{ ne oynadı}$ ‘As for Ali, what did HE play?’ in (146). However, note that this constituent question straightforwardly encodes the same overall meaning. So the corresponding constituent question with contrastive topic blocks the polar question with constituent focus. In the case of sentence-final *-mI* questions, there is no corresponding constituent question that could be responsible for the blocking.

5.5 Contrastive topic and the organization of discourse

After having established interpretations of contrastive topics in assertions, polar questions and constituent questions, let us discuss how such expressions are actually used in discourse.

²⁸ We indicate the focused expression *iskambil* ‘cards’ with capitalization, but in prosodic reality it is likely deaccented on a par with *-mI*-marked verbs in polar questions with CT and wh-expressions in constituent questions with CT.

One prominent feature of contrastive topics is that they express what we call anti-exhaustivity. In an assertion, they signal that the current contribution is not a complete answer to the general question under discussion (cf. Büring 1997 and subsequent literature, e. g. Tomioka 2010). An assertion like the first clause of (116), *ALİ_C İSKAMBİL_F oynadı*, indicates that the background question is not only about Ali. This feature follows, of course, from our analysis that the CT operator imposes a conjunctive interpretation of the alternatives. In contrast, the FS operator imposes a disjunctive interpretation. Thus we cannot define an exhaustivity operator on the CT operator as defined for FS in (122), as this operator would exclude the alternatives of the contrastive topic, whereas the CT operator essentially expresses a conjunction, hence includes these alternatives.

We have seen with examples like (116)(a,b) that it is not necessary for a contrastive topic to be felicitous that an explicit conjoined question is asked. A complex question can be divided into conjunctive subquestions that license contrastive topics. In such moves, we can assume that the requirement of the contrastive topic, that there be a conjunctive question, is accommodated in such a way that a complete answer to all the subquestions is an answer to the original question.

Another case of question accommodation was discussed by Hirschberg (1985) and Büring (1997) with examples of the form (150):²⁹

- (150) a. *S₁: Ali ne oynadı?*
 ‘What did Ali play?’
 b. *S₂: Vallahi, MERVE_C İSKAMBİL_F oynadı.*
 ‘Well, as for MERVE, she played CARDS.’

With (b), *S₂* does not address question (a) directly, presumably because *S₂* does not know the answer or has some other reason to avoid it. But (b) presupposes, and accommodates, a conjunction of questions of the type ‘What did *x* play?’, where *x* can be anchored to Ali or Merve; of this complex question, the question ‘What did Merve play?’ is answered. Extending a question can be useful in cases in which the speaker *S₂* suspects a more general interest of the addressee *S₁*.

²⁹ One of Hirschberg’s examples is *Do you speak Portuguese? – My husband_C does* (with B accent), where the answer can be analyzed as accommodating the conjunction of questions of the form ‘Does *x* speak Portuguese or not?’ Here, *x* ranges over persons, including the speaker, that can assist the speaker with competence in Portuguese. One of Büring’s examples is *Where were you at the time of the murder? – I_C was at home_F*, where the answer accommodates the conjunction of questions of the form ‘Where was *x* at the time of the murder?’, a typical question for the suspects of a murder case.

In (150), an assertion with a contrastive topic in the context of a question led to the accommodation of a different question. The following example presents a case in which a question with a contrastive topic leads to the accommodation of a question:

- (151) a. S_1 : *Ali iskambil oynadı mı?*
 ‘Did Ali play cards?’
 b. S_2 : *Evet. / Hayır.*
 ‘Yes.’ / ‘No.’
 c. S_1 : *(Peki) MERVE_C iskambil oynadı mı?*
 ‘As for Merve, did SHE play cards?’
 d. S_2 : *Evet, o da iskambil oynadı. / Hayır, o iskambil oynamadı.*
 ‘Yes, she played cards too. / No, she didn’t play cards.’

The first question (151)(a) does not have a contrastive topic, and hence does not require an input CS expressing a conjoined question. Contrast is only established with the second question, (151)(c), which has an input requirement that a conjunction of questions of the form ‘Did x play cards?’ is asked. The closest discourse state at which this is the case is after the first question, (a); however, at this point in fact only one question is asked. We propose that question (c) is interpreted with respect to the CS after (a), at which point a conjoined question is accommodated with question (a) as one of its subquestions.

- (152) a. $\langle \dots, C_0 \rangle + (151)(a) = \langle \dots, C_0, C_0 + \lambda C[\sqrt{C} \cup C + \cdot \varphi_{ac} \cup C + \cdot \neg \varphi_{ac}] \rangle = \langle \dots, C_0, C_1 \rangle$
 b. $\langle \dots, C_0, C_1 \rangle + \text{Evet.} = \langle \dots, C_0, C_1, C_1 + \cdot \varphi_{ac} \rangle = \langle \dots, C_0, C_1, C_2 \rangle$
 c. $\langle \dots, C_0, C_1, C_2 \rangle + (151)(c) = \langle \dots, C_0, C_1, C_2, C_2 \cap C_1 + (\text{accomm.}) + (151)(c) \rangle$

In (150) and (151), a contrastive topic in the context of a question led to the accommodation of a new question. Such accommodations are possible in the absence of an overt question, as in the following case:

- (153) a. S_1 : *Duydun mu? Ali bütün gece iskambil oynadı.*
 ‘Did you hear? Ali played cards all night.’
 b. S_2 : *Hm. (Peki) MERVE_C iskambil oynadı mı?*
 ‘Interesting... As for Merve, did SHE play cards?’

The assertion by S_1 plausibly generates an interest in the card-playing behavior of persons at a particular situation. For this reason, the presupposition of S_2 ’s question, that a conjunction of questions like ‘x played cards’ is asked, can easily be accommodated.

We provide (154) to briefly illustrate the different conversational felicity conditions of polar questions with focus and contrastive topic.

- (154) a. S_1 : *Kim iskambil oynadı?*
 ‘Who played cards?’
 b. S_2 : *ALİ_F iskambil oynadı.*
 c. S_1 : *ALİ_F mi iskambil oynadı?*
 c'. S_1 : *#MERVE_F mi iskambil oynadı?*
 c''. S_1 : *#ALİ_C iskambil oynadı-mı?*

With (b), S_2 answers the question by S_1 ; however, S_1 can react with questioning this answer in a focused polar question, typically because S_1 has epistemic reservations about the given answer. This can be modeled in the following way, assuming that a, m and h are persons under discussion:

- (155) a. $\langle \dots, C_0 \rangle + (154)(a) = \langle \dots, C_0, \sqrt{C_0} \cup C_0 + \cdot\varphi_{ac} \cup C_0 + \cdot\varphi_{mc} \cup C_0 + \cdot\varphi_{hc} \rangle$
 $= \langle \dots, C_0, C_1 \rangle$
 b. $\langle \dots, C_0, C_1 \rangle + (154)(b) = \langle \dots, C_0, C_1, C_1 + \cdot\varphi_{ac} \rangle$
 c. $\langle \dots, C_0, C_1, C_1 + \cdot\varphi_{ac} \rangle + (154)(b)$ pragmatically excluded,
 $\langle \dots, C_0, C_1, C_1 + \cdot\varphi_{ac} \rangle + \Re = \langle \dots, C_0, C_1, C_1 + \cdot\varphi_{ac}, C_1 \rangle$, retraction of last move
 $\langle \dots, C_0, C_1, C_1 + \cdot\varphi_{ac}, C_1 \rangle + (154)(c) = \langle \dots, C_0, C_1, C_1 + \cdot\varphi_{ac}, \sqrt{C_1} \cup C_1 + \cdot\varphi_{ac} \rangle$

For the transition from (155)(a) to (b), notice that the requirements of the focused assertion (154)(b) are satisfied after the constituent question (154)(a). At this point, asking the question (154)(c) is pragmatically excluded because φ_{ac} is already established, hence the commitment space would not change by this move. The situation can be rescued by retraction of the last move, making C_1 again the active CS. The motivation for asking question (154)(c) is that S_1 has reasons not to accept this answer, at least not at first pass. At C_1 , the question can be asked again; notice that the requirements of this focused polar question are satisfied in the context of C_1 . The question (154)(c') would not be felicitous in this context, as the exhaustivity implicatures of this question and the previous focused assertion in (154)(b) are contradictory. The retraction operation would not be appropriate here because it would remove the proposition φ_{ac} that was just given. Minimally different from (154)(c), the contrastive topic question (154)(c'') is excluded because it attempts to verify φ_{ac} while simultaneously acknowledging the CS where φ_{ac} is asserted as answering part of the same underlying conjoined question.

5.6 Sorting keys and topical question constituents

In Section 5.1, we have illustrated a conjoined question by example (105), ‘What did Ali play and what did Merve play?’, where cards and domino were the only

games under discussion. A speaker may request the same information by the following question, if Ali and Merve are the only persons under discussion:

- (156) *Kim iskambil oynadı, ve kim domino oynadı?*
 ‘Who played cards, and who played domino?’

The representation of the conjoined question in (156) is given in (157), where boldfacing indicates how it differs from (107).

$$(157) \quad C_0 + (156) = \sqrt{C_0} \cup \{c \in C_0 \mid \{\varphi_{ac}, \mathbf{\varphi_{ad}}\} \subseteq c \vee \{\varphi_{ac}, \varphi_{md}\} \subseteq c \vee \{\varphi_{ad}, \varphi_{mc}\} \subseteq c \vee \{\mathbf{\varphi_{mc}}, \varphi_{md}\} \subseteq c\}$$

The difference shows up in the questions that remain after an initial answer. If (107) is assertively updated by ‘Ali played cards’, then the CS is reduced to (158) (a), where the question what Merve played is asked. If, on the other hand, the same assertive update applies to (157), then the resulting CS is (158)(b), where the question who played domino remains.³⁰

- (158) a. (107) + $\cdot\varphi_{ac} = \{c \in C_0 \mid \varphi_{ac} \in c \wedge \{\varphi_{mc}, \varphi_{md}\} \subseteq c\}$
 b. (157) + $\cdot\varphi_{ac} = \{c \in C_0 \mid \varphi_{ac} \in c \wedge \{\varphi_{ad}, \varphi_{md}\} \subseteq c\}$

An answer to a single-answer multiple constituent question like (104)(b) *Kim ne oynadı* ‘who played what’ is different again, and results in a single-rooted CS:

- (159) a. $C_0 + (104)(b) = \sqrt{C_0} \cup \{c \in C_0 \mid \varphi_{ac} \in c \vee \varphi_{ad} \in c \vee \varphi_{mc} \in c \vee \varphi_{md} \in c\}$
 b. $(a) + \text{FS}([\text{ActP} [\text{TP } \text{ALI}_F \text{ISKAMBİL}_F \text{oynadı}]_{[\text{Act}^\circ \cdot]]]) = \{c \in C_0 \mid \varphi_{ac} \in c\}$

In the mini situation that we are considering here, with two persons and two games, it appears a bit arbitrary in which way the information increases are orchestrated by the conjoined questions. At best, thematic constraints like a particular interest in persons or agents might favor (156) over the conjunctive question in (105). However, let us consider a situation with two persons, Ali and Merve (a, m), and three games, backgammon (Turkish *tavla*), cards, and domino (b, c, d). We then have the following situation:

- (160) $C_0 + \text{Ali ne oynadı, ve Merve ne oynadı?}$
 $= \sqrt{C_0} \cup C_0 + [[\cdot\varphi_{ab} \vee \cdot\varphi_{ac} \vee \cdot\varphi_{ad}] \& [\cdot\varphi_{mb} \vee \cdot\varphi_{mc} \vee \cdot\varphi_{md}]]]$

³⁰ The constituent order in the answer may reflect this (cf. Section 2.1): $\text{ALI}_C \text{ISKAMBİL}_F \text{oynadı}$ and $\text{ISKAMBİL}_C \text{ALI}_F \text{oynadı}$, respectively.

$$\begin{aligned}
&= \sqrt{C_0} \cup \{c \in C_0 \mid \{\varphi_{ab}, \varphi_{mb}\} \subseteq c \vee \{\varphi_{ac}, \varphi_{mb}\} \subseteq c \vee \{\varphi_{ad}, \varphi_{mb}\} \subseteq c \\
&\quad \{\varphi_{ab}, \varphi_{mc}\} \subseteq c \vee \{\varphi_{ac}, \varphi_{mc}\} \subseteq c \vee \{\varphi_{ad}, \varphi_{mc}\} \subseteq c \\
&\quad \{\varphi_{ab}, \varphi_{md}\} \subseteq c \vee \{\varphi_{ac}, \varphi_{md}\} \subseteq c \vee \{\varphi_{ad}, \varphi_{md}\} \subseteq c\}
\end{aligned}$$

(161) $C_0 + \text{Kim iskambil oynadı, kim domino oynadı, ve kim tavla oynadı?}$

$$\begin{aligned}
&= \sqrt{C_0} \cup C_0 + [\cdot\varphi_{ab} \vee \cdot\varphi_{mb}] \& [\cdot\varphi_{ac} \vee \cdot\varphi_{mc}] \& [\cdot\varphi_{ad} \vee \cdot\varphi_{md}] \\
&= \sqrt{C_0} \cup \{c \in C_0 \mid \{\varphi_{ab}, \varphi_{ac}, \varphi_{ad}\} \subseteq c \vee \{\varphi_{mb}, \varphi_{ac}, \varphi_{ad}\} \subseteq c \\
&\quad \{\varphi_{ab}, \varphi_{ac}, \varphi_{md}\} \subseteq c \vee \{\varphi_{mb}, \varphi_{ac}, \varphi_{md}\} \subseteq c \\
&\quad \{\varphi_{ab}, \varphi_{mc}, \varphi_{ad}\} \subseteq c \vee \{\varphi_{mb}, \varphi_{mc}, \varphi_{ad}\} \subseteq c \\
&\quad \{\varphi_{ab}, \varphi_{mc}, \varphi_{md}\} \subseteq c \vee \{\varphi_{mb}, \varphi_{mc}, \varphi_{md}\} \subseteq c\}
\end{aligned}$$

The first question, (160), suggests nine continuations with two propositions each, the second, (161), suggests eight with three propositions each. This does not seem a great difference. However, notice what happens when the conjoined question is answered by the proposition that Ali played backgammon, φ_{ab} .

$$(162) \quad (160) + \cdot\varphi_{ab} = \sqrt{C_0} \cup \{c \in C_0 \mid \varphi_{mb} \in c \vee \varphi_{mc} \in c \vee \varphi_{md} \in c\}$$

$$\begin{aligned}
(163) \quad (161) + \cdot\varphi_{ab} &= \sqrt{C_0} \cup \{c \in C_0 \mid \{\varphi_{ac}, \varphi_{ad}\} \subseteq c \vee \{\varphi_{ac}, \varphi_{md}\} \subseteq c \vee \\
&\quad \{\varphi_{mc}, \varphi_{ad}\} \subseteq c \vee \{\varphi_{mc}, \varphi_{md}\} \subseteq c\}
\end{aligned}$$

With the first strategy, the simple question, ‘What did Merve play?’, remains to be answered. With the second question, the more complex question, ‘Who played cards, and who played domino?’ remains to be answered. Obviously, the first strategy is more efficient. If we also assume that answering a constituent question leads to exhaustification with focus, as discussed in Section 4.3, then the answer φ_{ab} to (160) would exclude two options $\{\varphi_{ac}, \varphi_{ad}\}$, whereas the same answer to (161) would just exclude one option, φ_{mb} . Again, this strategy appears less efficient than (162).

The structural difference in the two scenarios is that there are two persons, and more than two games. In this situation it is better to ask for each person about the games that he or she played, and not ask for every game, who played that game. There might be additional reasons to ask the first question, in particular, speakers might be more interested in the properties of other persons than in the properties of games.

Kuno (1982) introduced the notion of a Sorting Key for such multiple questions. The alternatives introduced by the *wh*-constituents are not treated in a parallel way. Rather, one is the key by which one can access the data in a database. It is useful that the set of entities in the sorting key is smaller than the set of entities that are related to the other set of alternatives. In the current

framework, this rule leads to the construction of conjoined questions that allows us to answer a multiple question in a more compact way.

It should be mentioned that differences like (160) and (161) would be treated by a separate bookkeeping device, stacks of questions under discussions, or discourse trees, in other theories (cf. van Kuppevelt 1995; Ginzburg 1996; Roberts 1996; Kadmon 2001; Büring 2003; Constant 2014; Jokilehto 2017; Benz and Jasinskaja 2017; Beaver et al. 2017; Riester 2019). Our examples would be modeled by question stacks like (164)(a) and (b):

- (164) a. *What did the children play?* b. *Who played the games?*
 Who played backgammon? *What did Ali play?*
 Who played cards? *What did Merve play?*
 Who played domino?

It is remarkable that in the current framework, the additional assumption of question stacks or discourse trees is not necessary.

In our two examples, different sorting keys were generated by different ways of forming conjunctions of constituent questions. But the sorting key can also be identified by a multiple constituent question. In addition to multiple constituent questions that request a single-pair answer as in (104), cf. also (159), there are multiple constituent questions that request pair-list answers (cf. Higginbotham and May 1981; Comorovski 1996). How do they differ, how can a multiple constituent question express a distinction between the contributions of the individual *wh*-constituents?

We would like to propose that just as alternatives to regular meanings can serve for focus purposes and for contrastive topic purposes, so the alternatives introduced by *wh*-constituents can serve for focus purposes and for contrastive topic purposes.

There is indeed evidence that constituent question words can be interpreted in a topical position, and that this is associated with a particular interpretation. Kiss (1993) argued that in Hungarian multiple constituent questions, the initial question constituent can occur in a topic position, which then triggers a pair-list-reading, or in the regular focus position, which leads to the single pair reading discussed in Section 4.6. Hosono (2014) argues that in Japanese, topic-marked question words also receive that interpretation. In other languages, the syntactic difference between question constituents in topic positions and others may be less prominent.

To clarify the parallels between focus and questions, we first specify the FS operator in a somewhat different way. We assume an interrogative focus operator for constituent questions (165)(a), where *F* is the sortal restriction of a question (e. g.

PERSON for *kim* ‘who’) and B the background. The corresponding non-interrogative focus operator is given in (b); it uses the interrogative meaning of (a) as a condition on the input CS, and specifies the focus meaning F in the output CS.

$$(165) \text{ a. } FS^{wh}(F, B) = \lambda C [\sqrt{C} \cup \bigcup_{x \in F} [C + \cdot B(x)]]$$

$$\text{ b. } FS(\langle F', F \rangle, B) = \lambda C \frac{C = \sqrt{C} \cup \bigcup_{x \in F} [C + \cdot B(x)]}{C + \cdot B(F')}$$

Similarly, we assume an interrogative topic operator as in (166)(a), and a corresponding non-interrogative topic operator as in (b) that uses the interrogative meaning as a restriction on the input CS.

$$(166) \text{ a. } CT^{wh}(T, B) = \lambda C [\sqrt{C} \cup \bigcap_{x \in T} [C + \cdot B(x)]]$$

$$\text{ b. } CT(\langle T', T \rangle, B) = \lambda C \frac{C = \text{the smallest } C' [C' \supseteq [\sqrt{C} \cup \bigcup_{x \in T} [C + \cdot B(x)]]]}{C + \cdot B(T')}$$

There is a difference between these two constructions, insofar as in the CT case the input CS is restricted to the smallest C' that satisfies the condition that in C' the CT-question is asked. However, we could express condition (165)(b) in a similar way, without change in meaning.

$$(167) \text{ FS}(\langle F', F \rangle, B) = \lambda C \frac{C = \text{the smallest } C' [C' \supseteq [\sqrt{C} \cup \bigcup_{x \in F} [C + \cdot B(x)]]]}{C + \cdot B(F')}$$

The only difference is that in the case of the FS-operator, reference to the smallest set would be redundant. We may see the minimality condition for the input CS as evidence of a pragmatic rule that forces speakers and addressees to understand the restrictions imposed on the context in a maximally informative way.

We can now observe that a multiple constituent question in a construction built from CT^{wh} and FS^{wh} receives a multiple question, or pair-list reading, where the questions are sorted by the question constituent in the topic position:

$$(168) \text{ a. } \llbracket [_{CTP} [_{DP} \textit{kim}] \lambda t [_{ActP} [_{TP} t \textit{ ne oynadı}] [_{Act^o} FS^{wh}] [_{CT^o} CT^{wh}]] \rrbracket$$

$$\text{ b. } = CT^{wh}(\llbracket [_{DP} \textit{kim}] \rrbracket, \lambda x [FS^{wh}(\langle \lambda y [\varphi_{xy}], \llbracket \textit{ne} \rrbracket \rangle)])$$

$$\text{ c. } = CT^{wh}(\{a, m\}, \lambda x \lambda C [\sqrt{C} \cup \bigcup_{y \in \{c, d\}} [C + \cdot \varphi_{xy}]])$$

$$\text{ d. } = \lambda C [\sqrt{C} \cup \bigcap_{x \in \{a, m\}} [\sqrt{C} \cup \bigcup_{y \in \{c, d\}} [C + \cdot \varphi_{xy}]]]$$

$$\text{ e. } = \lambda C [\sqrt{C} \cup [(C + \sqrt{C} \cup \bigcup_{y \in \{c, d\}} [C + \cdot \varphi_{ay}]) \cap (C + \sqrt{C} \cup \bigcup_{y \in \{c, d\}} [C + \cdot \varphi_{my}])]]$$

$$\text{ f. } = \lambda C [\sqrt{C} \cup [(C + \sqrt{C} \cup [(C + \cdot \varphi_{ac}] \cup [C + \cdot \varphi_{ad}]) \cap (C + \sqrt{C} \cup [(C + \cdot \varphi_{mc}] \cup [C + \cdot \varphi_{md}])]]]$$

$$\text{ g. } = \lambda C [\sqrt{C} \cup \{c \in C \mid \{\varphi_{ac}, \varphi_{ad}\} \subseteq c\} \cap \{c \in C \mid \{\varphi_{mc}, \varphi_{md}\} \subseteq c\}]$$

$$\text{ h. } = \lambda C [\sqrt{C} \cup \{c \in C \mid \{\varphi_{ac}, \varphi_{mc}\} \subseteq c \vee \{\varphi_{ac}, \varphi_{md}\} \subseteq c \vee \{\varphi_{ad}, \varphi_{mc}\} \subseteq c \vee \{\varphi_{ad}, \varphi_{md}\} \subseteq c\}]$$

We end up with a conjoined question having the same meaning as the one we derived in (106) with explicit conjunction of questions and in (111) with quantification into questions. These three linguistic forms are known to elicit the same answer patterns. In particular, for all of them a single pair answer like the assertion of $\cdot\varphi_{ac}$ typically is not sufficient, as it results in a CS which is restricted to two continuations, requiring the answers $\cdot\varphi_{mc}$ or $\cdot\varphi_{md}$. And this is different from the single pair question in (104).

In this section we have seen how contrastive topic alternatives are used in discourse, and in particular, how they interact with focus alternatives and with the alternatives introduced by *wh*-constituents, regardless whether they occur in assertions or questions. We hope we could show how much expressive power the formal modeling provided here has.

6 Conclusion

In this paper, we developed a theoretical model for the contribution of focus and contrastive topic in polar questions, constituent questions, and alternative questions, and in assertions that answer such questions. We developed this model for Turkish, which marks focus in polar questions in a way that is clearly distinct from contrastive topic. We did so in the framework of Commitment Spaces which represent discourse states by the information agreed upon as shared by the participants, plus the possible legal continuations.

In Section 4, we have shown that the commitment space framework provides a model of common ground that captures the effect of focus in assertions and polar questions, including alternative questions. In all these cases, focus contributed exactly the same meaning: a disjunction over the alternatives introduced by focus on the level of CS updates. We have seen that the meaning of constituent questions involves a disjunction over alternatives as well, now introduced not by focus but by the lexical meaning of *wh*-constituents. We have shown why such constituent question meanings are not compatible with additional focus exploited at the level of CS updates.

In our model, no additional machinery is necessary to keep records of questions under discussion (QUDs), as in Roberts (1996) and Büring (2003), due to an enrichment of the notion of context set or common ground. In this, the current framework is similar to Inquisitive Semantics, for which assertive updates and inquisitive updates are of the same type (Ciardelli et al. 2019; Onea 2016). It differs in detail, however, as in Inquisitive Semantics the difference between assertive and inquisitive updates amounts to updating with a single

proposition or updating with a non-singleton set of propositions; this does not allow for the modeling of monopolar questions, which turned out to be essential here. In particular, it was argued that alternative questions and constituent questions are, semantically, disjunctions of monopolar questions, and that focus in assertions and polar questions both indicate that the input commitment space is constrained by a particular question.

In Section 5, we argued that the commitment space framework also offers a model for the interpretation of contrastive topics in questions and assertions. We proposed that contrastive topics contribute a second layer of alternatives that are exploited above the level of focus, and that these alternatives are interpreted conjunctively, not disjunctively like the focus alternatives. This conjunctive interpretation captures the known discourse function of contrastive topics, that they signal the presence of a complex background question, which can be expressed as a conjunction of questions.

Our main empirical domain was the interpretation of the Turkish focus question marker *-mİ*. We have provided models for focused polar questions, cf. (25)(a), by the FS operator, cf. (57), and for polar questions with contrastive topics, cf. (25)(b), by the CT operator, cf. (139). We have also treated alternative questions, (22), as disjunctions of focused polar questions, cf. (89), we have analyzed constituent questions with contrastive topics, cf. (146), and we have explained two types of multiple constituent questions, cf. (104) and (168). This included the various answer patterns to such questions and the application of the exhaustivity operator.

There are a number of more general points that we feel should be highlighted here because they offer new perspectives on assertions, questions, and the information structural notions of focus and contrastive topic.

One particularly interesting point arises from the comparison between focus and contrastive topic. Both make use of alternatives, and both kinds of alternatives restrict the input CS. However, focus and contrastive topics make use of alternatives in different ways: Whereas focus leads to a disjunction of alternatives, contrastive topic leads to their conjunction. This relates focus and topic to the two basic Boolean connectives. This relation extends to the formation of questions. Questions essentially create the conditions that the alternatives of assertions presuppose for their input CS. A simple constituent question is built on a disjunction of alternatives, cf. (95), but we have seen that quantification into questions, cf. (111), and topical question, cf. (166), can be built on a conjunction of alternatives. In addition, questions can have their own foci and contrastive topics, which impose restrictions on their own input CSs as well. As both the terms “focus” and “contrastive topic” are problematic, one could use this fundamental distinction to differentiate between the two, and talk about disjunctive

alternatives and conjunctive alternatives. Disjunctive and conjunctive alternatives can occur in ordinary expressions that also have a regular meaning, and also on wh-constituents that only have alternative meanings.

Many languages have a similar morphosyntactic marker for questions: Russian *li* (cf. Schwabe 2004), Bulgarian *li* (cf. Rudin et al. 1999) and *xom* in Georgian (Harris 1984). At the same time, these languages do not have morphosyntactic focus markers for assertions. Why should there be such a discrepancy between questions and assertions? One reason might be that in the case of assertions, the context often makes it clear where the focus should be. Often, assertions are answers to overt questions, or the context can be understood to lead to a question. Questions themselves are presumably less restricted by the preceding context, they typically form a new context. So, it might be advantageous to have an explicit marker for those cases in which a question presupposes a particular context.

Acknowledgements: We thank the audiences of presentations of materials related to the current paper, in particular at the University of Wisconsin-Milwaukee (2 March 2018), at the Workshop “Meaning in Non-Canonical Questions” at Universität Konstanz (June 7-9, 2018), at the Leibniz-Zentrum Allgemeine Sprachwissenschaft (ZAS) (23 October 2018), and at the Institut Jean Nicod, EHESS Paris (5 June 2019). In particular, we thank Daniel Büring for early inspiration, Edgar Onea for discussion of the paper and Hans-Martin Gärtner for a close reading and important comments. Work on this project was partly funded by the ERC project “Speech Acts in Grammar and Discourse” (SPAGAD), Action Number 787929.

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