Speaker Attitudes Predict Epistemic Biases in Polar Questions: Evidence from Farsi

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1. Introduction

This paper investigates polar questions in Farsi with three discourse particles: *ke*, *dige*, and *mage*. We demonstrate that such particles convey certain (not necessarily epistemic) attitudes that turn out to predict the correct settings for the original and contextual biases associated with the corresponding questions. Based on this observation, we argue that introducing attitude implications can significantly simplify the theory of question bias in the sense that original and contextual biases need not be considered native to the question but rather fall out as its use conditions.

The literature has distinguished between two kinds of bias in non-canonical polar questions, often called 'original belief' (OB) and 'contextual evidence' (CE) (Ladd 1981; Büring & Gunlogson 2000; Romero & Han 2004; Roelofsen et al. 2013; Sudo 2013; Domaneschi et al. 2017; a.o.). Specifically, OB reveals the speaker's prior belief regarding the true answer, whereas CE reveals the shared evidence in the speech context for or against a possible answer.

These two kinds of bias stand out most clearly when they oppose each other, as seen in English polar questions with (epistemic) *really*. For example, the question in (1) raises the issue of whether Jill owns a bike by partitioning the logical space into a positive and a negative answer (Hamblin 1973). Additionally, this question conveys the speaker's prior belief that the negative answer is true (OB), along with the presence of shared evidence (say, due to a preceding utterance) that implies the positive answer (CE).

(1)   Does Jill really own a bike?

    OB: The speaker believed that Jill does not own a bike.

    CE: There is evidence in the current context suggesting that Jill owns a bike.

Notably, both of these biases are *epistemic* in a broad sense, being about belief (OB) or knowledge/evidence (CE). Prior work has noted that polar questions may also convey non-epistemic bias flavors, such as deontic, bouletic or teleological (Huddleston & Pullum 2002; van Rooy & Šafářová 2003; Reese 2007; AnderBois 2019). For example, the high negation question in (2) registers that according to the speaker's moral rules the addressee should be ashamed of themselves, a form of deontic bias.

(2)   *Mother addressing her misbehaving child*:

    Aren't you ashamed of yourself?

Crucially, epistemic and non-epistemic biases may be associated with the same question form and co-occur in the same context. This is evident in (2), where, in addition to the deontic bias, there must be contextual evidence suggesting that the addressee is not ashamed of themselves.

Building on the observation that epistemic and non-epistemic biases may occur simultaneously, we argue that the familiar epistemic biases (OB and CE) need not be viewed as intrinsic to the question but instead constitute its use conditions. That is, these biases fall out from a single source, which we call an 'attitude implication' (AI). An AI conveys a speaker's attitude (not necessarily epistemic) toward the question prejacent, resulting in restrictions on how the question can be used (cf. Tabatowski 2022). We

draw empirical support for this claim from polar questions in Farsi with three discourse particles (i.e., *ke*, *dige*, and *mage*), showing that the AIs generated by these particles predict the correct OB/CE settings in which the pertaining questions may felicitously occur.

The paper is structured as follows. Section 2 presents the main Farsi data and establishes the empirical patterns regarding AIs and OB/CE combinations. Section 3 proposes a semantics for *ke*, *dige*, and *mage*, capturing their associated AIs. Section 4 applies this semantics to derive the OB/CE distribution of these particles. Section 5 concludes and also discusses some general implications of the analysis.

2. Data from Farsi

This section presents the key data and establishes two basic observations that form the foundation of the proposal developed in the following sections.

2.1. Background on declaratives and polar interrogatives in Farsi

Canonical declaratives and canonical polar interrogatives in Farsi follow the same default SOV word order and only differ in final contour. Specifically, the former employ a final fall ($\searrow$) while the latter employ a final rise ($\nearrow$), as shown in (3)–(4).[1]

(3) Ali Sara ro   did.$\searrow$
     Ali Sara ACC saw
     'Ali saw Sara.'

(4) Ali Sara ro   did?$\nearrow$
     Ali Sara ACC saw
     'Did Ali see Sara?'

It is important to emphasize that canonical polar interrogatives in Farsi differ from rising declaratives in English. Farsi polar interrogatives incorporate a declarative word order plus a final rise, so they look similar in form to English rising declaratives, like *You are the new boss?*. However, while the former receive a neutral interpretation by default (Mohammadi 2024), the latter come with an obligatory bias effect (Gunlogson 2001; Malamud & Stephenson 2015; Farkas & Roelofsen 2017; Rudin 2022).

Another point is that negative polar interrogatives in Farsi are not necessarily biased. Farsi employs a single form of negation (cf. Taleghani 2008; Kahnemuyipour 2017), manifested through the negative verbal prefix *ne-* (with allophones *na-* and *ni-*). Importantly, negation in polar interrogatives need not lead to bias, as demonstrated in (5).

(5) *Speaker announces that they are going to the shopping center and asks their mom*:

     Maman čizi   lâzem na-dâri?
     Mom   anything need NEG-has
     'Mom, do you need anything?'

Although positive polar interrogatives are typically considered to be the unmarked (unbiased) form, Mohammadi (2024) argues that negative polar interrogatives can, but need not, convey bias, similar to the optional bias found in English polar interrogatives with low negation (Romero & Han 2004). Mohammadi further contends that, in certain contexts, negative questions serve as the unbiased form as their use could be a matter of politeness. Since our focus here is on polar interrogatives that exhibit bias *obligatorily*, we defer discussion of what governs the choice between the positive and the negative form to future research.

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[1] The question particle *âyâ* 'whether' is sometimes used in polar questions (Mameni 2010). However, this particle is practically absent in colloquial speech and will be ignored here. Notably, the rising contour is still necessary when *âyâ* is used, as shown in (i).

(i) âyâ   Ali Sara ro   did?$\nearrow$
     whether Ali Sara ACC saw
     'Did Ali see Sara?'

From now on out, we will not mark final contours, opting instead for conventional typographical tools.

2.2. Key data

Our main data concerns polar interrogatives with the particles *ke*, *dige* and *mage*, as in (6)–(8).

(6)	Ali umad ke?	(7)	Ali umad dige?	(8)	mage Ali umad?
	Ali came KE		Ali came DIGE		MAGE Ali came
	'Did Ali come?'		'Did Ali come?'		'Did Ali come?'

It is worth noting that, since Farsi is a free word order language, these particles may occur in various sentence positions. Here we select the least marked options: sentence final for *ke* and *dige*, sentence initial for *mage*. Note also that *ke* and *dige* cannot appear at the beginning of a sentence, while *mage* can be placed sentence finally. As for sentence-internal positions, these are feasible but the particle may associate with the adjacent constituent, leading to subtle information-structural effects that need not concern us here.

The questions in (6)–(8) are all information seeking, asking whether Ali came and requiring an answer from the addressee. We take this to be a reflex of their regular question semantics, which partitions the space of possibilities into a positive answer and a negative answer (Hamblin 1973). While these questions share a canonical interrogative force and raise the same issue, they differ in the speaker's attitude they convey and also in their conditions of use, an apparent effect of the contained discourse particles. Specifically, we make the two empirical observations listed in (9)–(10).

(9) *Observation #1*

Each question form conveys an AI.

(10) *Observation #2*

Each question form occurs in a specific OB/CE configuration.

Starting with Observation #1, there is a robust intuition that (6)–(8) convey a speaker's attitude toward the question prejacent. That is, *ke*-questions signal the speaker's realistic desire for the question prejacent to be the true answer. In (6), this inference amounts to something close to 'The speaker hopes that Ali came'. In turn, *dige*-questions convey the speaker's tentative or indirect inference that the question prejacent is true. In (7), this inference can be paraphrased as 'The speaker infers that Ali came'. These intuitions are more vividly illustrated by the following two examples. In (11), A1 arrives at the result through some calculations, which is natural, whereas the desire expressed by A2 does not necessarily determine the correct result, hence the infelicity. In (12), A2 hopes that the dress is reasonably priced and the question is fine. However, the question that A1 asks is infelicitous due to the absence of a good reason to support such an expectation.[2]

(11) *A first grader is working on her math assignment and asks her mom*:

A1:	do	bealâve	do	čâhâr	miše	dige?	A2:	# do	bealâve	do	čâhâr	miše	ke?
	two	plus	two	four	becomes	DIGE			two	plus	two	four	becomes	KE

'Does two plus two equal four?'
⤳ The speaker infers that it does.

(12) *A is talking with her friend B, saying that she needs to buy a dress for a party.*

B: I saw a nice dress at Zara. It was too small for me, but I think it will fit you.

A1:	# gerun	na-bud	dige?	A2:	gerun	na-bud	ke?
	expensive	NEG-was	DIGE		expensive	NEG-was	KE

'Was it not expensive?'
⤳ The speaker hopes that it was not.

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[2] Although, notice that if an appropriate reason can be accommodated in the context, the judgment improves.

Finally, *mage*-questions express the speaker's violated expectation that the prejacent is false (cf. Mameni 2010). In (8), this can be rendered as 'The speaker is surprised that Ali came', which can capture an active or a non-active expectation of the speaker that Ali did not come. These intuitions are summarized in Table 1.

Question Type	Attitude Implication
p-ke?	Speaker hopes that *p*
p-dige?	Speaker infers that *p*
mage-p?	Speaker is surprised that *p*

Table 1: Attitude implications conveyed by Farsi polar questions with *ke*, *dige*, and *mage*.

Moving on to Observation #2, we find that each particle may occur only in specific felicity conditions. We placed each question form in different settings, where the features of OB and CE varied relative to the question prejacent *p* along three levels: favoring *p*, opposing *p*, or being neutral regarding *p*. For instance, in (13) the speaker initially believes that it is not raining ($OB = \neg p$), while the context provides evidence that it is raining ($CE = p$). In this conflicting bias scenario, only a *mage*-question is acceptable.

(13)   *A heard from the weather forecaster that today was going to be sunny. She had spent the entire day working in a windowless room. B enters the room, carrying a wet umbrella, and A asks B whether it is raining*:

   a.   # bârun miyâd ke?   b.   # bârun miyâd dige?   c.   mage   bârun miyâd?
        rain   comes KE   rain   comes DIGE   MAGE rain   comes

Table 2 summarizes the distribution of polar questions with biased particles in different settings.

CE \ OB	*p*	neutral	$\neg p$
p	*p-dige?*	*p-dige?*	*mage-p?*
neutral	*p-dige?*, *p-ke?*		
$\neg p$			

Table 2: Distribution of Farsi questions with *ke*, *dige*, *mage* across different OB/CE settings.

We will argue that the pairing of these two observations, i.e., that specific AIs are correlated with specific OB/CE features, is not a coincidence. Rather, the two observations stem from the same source and can be folded into a single analysis.

3. Capturing Observation #1: A semantics for *ke*, *dige*, *mage*

This section proposes lexical entries for our targeted discourse particles from which Observation #1 directly follows.

3.1. Meaning dimension of AIs

What meaning dimension (entailment, presupposition, implicature) do the AIs discussed in the previous section pertain to? To answer this question, we first point out that these inferences are lexically triggered and cannot be canceled. Unlike the optionally biased uses of simple positive and negative polar questions (Mohammadi 2024), polar questions containing *ke*, *dige*, or *mage* cannot co-occur with speaker's statements like *I don't care*, *I have no idea*, or *I didn't know*, respectively. This is illustrated in (14)–(16).[3]

(14)   *A and B are talking about a party they have been invited to next week.*

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[3] These judgments are context specific and exclude accommodation. For example, (14) would sound felicitous with focal stress on *Ali*, resulting in the meaning 'I don't care if anyone else comes to the party, I just hope ALI comes'.

A: barâye man farq   na-dâre   ki   mehmuni miyâd. # Ali miyâd ke?
   for   me difference NEG-have who party   comes   Ali comes KE
   'I don't care who comes to the party. # Will Ali come, as I hope?'

(15) *A and B see an advertisement for a vacation in Konstanz.*

A: man hič   nazari na-dâram Konstanz kojâ-ye   donyâ-st. # spania-e dige?
   I   none idea   NEG-have Konstanz where-in world-is   Spain-is DIGE
   'I have no idea where Konstanz is. # Is it in Spain, as I conclude?'

(16) *A and B are on their first date, arranged through a blind matchmaking application. B starts sharing stories about his childhood in Isfahan.*

A: man ne-midunestam to   kojâe hasti. # mage   Isfahan-i?
   I   NEG-know   you where are   MAGE Isfahan-are
   'I didn't know where you were from. # Are you from Isfahan, to my surprise?'

Moreover, AIs project. For example, adding negation to the question results in negating the prejacent of the attitude predicate (the question radical) and not the attitude predicate itself. This is seen in (17)–(19).

(17) Ali na-yumad ke?   (18) Ali na-yumad dige?   (19) Mage   Ali na-yumad?
     Ali NEG-came KE   Ali NEG-came DIGE   MAGE Ali NEG-came

     $\neg p$? = 'Did Ali not come?' $\neg p$? = 'Did Ali not come?' $\neg p$? = 'Did Ali not come?'
     AI: Speaker hopes that $\neg p$ AI: Speaker infers that $\neg p$ AI: Speaker is suprised that $\neg p$

Finally, AIs typically introduce fresh information. They cannot be asserted by the speaker prior to uttering the question without a sense of redundancy or emphasis, marked in (20)–(22) by %.

(20) man omidvâram Ali emšab beyâd. % miyâd ke?
     I   hope   Ali tonight comes   comes KE
     'I hope Ali comes tonight. % Will he come, as I hope?'

(21) tâ-jâe   ke man midunam Ali emšab miyâd. % miyâd dige?
     as-much that I   know   Ali tonight comes   comes DIGE
     'As far as I know, Ali will come tonight. % Will he come, as I conclude?'

(22) tâ-jâe   ke man midunam Ali emšab ne-miyâd.   % mage   miyâd?
     as-much that I   know   Ali tonight NEG-comes   MAGE comes
     'As far as I know, Ali won't come tonight. % Will he come, to my surprise?'

For these reasons, we assume that AIs are conventional implicatures, in the sense of Potts (2005). That is, they constitute secondary entailments that are lexically triggered by our targeted discourse particles.

3.2. Semantic entries

We propose the two-dimensional semantic entries for *ke*, *dige* and *mage* in (23)–(25). According to these entries, the three discourse particles do not contribute to the at-issue meaning of the question and merely project AIs of different shapes. This is achieved via the 'dot' operator • (Pustejovsky 1996; Potts 2005; Asher 2011), which may attach to at-issue meanings of any semantic type. The sets *Dox*, *Epi*, *CG** store propositions that are believed, known, or expected to enter the Common Ground (respectively), *s* is the speaker of the relevant context, and $\succ$ is a desirability order over propositions. Finally, $\models$ marks logical entailment while $\approx\!\!\!\mid$ marks defeasible entailment, i.e., one that applies by default and involves uncertainty.

(23) $[\![ke]\!]^{c,w} = \lambda p \,.\, p \bullet \forall w' \in Dox_{s_c,w} : p \succ_{s_c,w'} \neg p$ (realistic desire)

(24) $[\![dige]\!]^{c,w} = \lambda p \,.\, p \bullet Epi_{s_c,w} \approx\!\!\!\mid p$ (defeasible inference)

(25) $[\![mage]\!]^{c,w} = \lambda p \,.\, p \bullet Dox_{s_c,w} \models \neg p \wedge CG^*_{c,w} \models p$ (violated expectation)

Starting with (23), *ke* conventionally implicates that the speaker finds the question prejacent p to be more desirable than $\neg p$ in all of her doxastic worlds. This captures the intuition of a realistic desire conveyed by questions with *ke*. Notice that this emotive doxastic semantics makes Farsi *ke* akin to English *hope*, which in addition to its preferential component has been claimed to include a doxastic component as well (Anand & Hacquard 2013; Portner & Rubinstein 2020).

Moving on to (24), *dige* conventionally implicates that the question prejacent p is defeasibly entailed by the speaker's knowledge. More specifically, this means that p follows from the speaker's evidence under some normality assumptions. Since these assumptions may turn out to be false, the AI conveyed here is indirect or tentative, which accords well with the intuition of inferential bias associated with such questions. This inferential semantics for *dige* is reminiscent of similar proposals put forward for English *must* (Kratzer 1991; Stone 1994; von Fintel & Gillies 2010; Mandelkern 2019; Waldon 2021).

Finally, (25) attributes to *mage* two opposing pressures. That is, what has been proposed to enter the Common Ground (reflected in the projected Common Ground) entails that the question prejacent p is true, whereas the speaker's belief state entails that p is false. This captures the intuition of violated expectation associated with such questions.

Notice that (25) encodes the stronger condition that the speaker's belief state entails $\neg p$ rather than the weaker condition that the speaker's belief state fails to entail p. The reason for this choice is that the latter condition would make the speaker's belief state compatible with both p and $\neg p$, thus leaving the intuition of violated expectation unexplained. While at first blush the former condition may appear to be too strong, strictly speaking this condition allows that the speaker had been unaware that their belief state entails $\neg p$ prior to obtaining the contextual evidence for p. This possibility of lack of introspection is still consistent with the usual sense of surprise conveyed by such questions.

In sum, we have proposed that the intuitions regarding the AIs summarized in Table 1 are encoded quite directly by the contained discourse particles.

3.3. Semantic composition

To derive the correct interpretations, all we have to assume is that the target discourse particles take scope above the question prejacent and below the Q morpheme. The result is a regular question partition plus a secondary entailment conveying some attitude on the part of the speaker toward the question prejacent. This is illustrated for the *dige*-question in (26), where it is assumed that the semantic composition works strictly within the at-issue dimension while the secondary meaning dimension is merely carried along.

(26)   a.   Ali mehmuni raft dige?
            Ali party   went DIGE

       b.   LF: [[[Ali mehmuni raft] dige] Q]

       c. $[\![\text{Ali mehmuni raft}]\!]^c = \lambda w \,.\, go_w(ali, party) =: A$
          $[\![\text{dige}]\!]^{c,w} = \lambda p \,.\, p \bullet Epi_{s_c,w} \approx\!\!\!| \; p$
          $[\![\text{[Ali mehmuni raft] dige}]\!]^{c,w} = A \bullet Epi_{s_c,w} \approx\!\!\!| \; A$
          $[\![\text{Q}]\!]^{c,w} = \lambda p \,.\, \{p, \neg p\}$
          $[\![\text{[[Ali mehmuni raft] dige] Q}]\!]^{c,w} = \{A, \neg A\} \bullet Epi_{s_c,w} \approx\!\!\!| \; A$

4. Capturing Observation #2: Deriving OB/CE restrictions from AIs

The proposed lexical meanings in (23)–(25) correctly predict the use conditions in Table 2 as follows. We first discuss *ke*-questions, which occur with positive OB and neutral CE. According to (23), the AI associated with such questions conveys a hope-like attitude, i.e., a preference based on what the speaker believes or considers likely. This derives the requirement that the OB supports the question prejacent. Moreover, notice that hoping something is incompatible with knowing it to be true or knowing it to be false (cf. *#It's raining and I hope it's raining*; *#It isn't raining but I hope it's raining*; Anand & Hacquard 2013). We take this property to follow from the doxastic flavor of the conveyed preference. That is, if the speaker already knew that the prejacent was true or that it was false, they would not have expressed a preference which is rooted in their beliefs but rather one which is independent of those beliefs. This explains why such questions require that the CE, which implies knowledge, be neutral.

As for *dige*-questions, the conditions for their use require positive OB or positive CE, while the AI in (24) states that the question prejacent defeasibly follows from the speaker's knowledge. A defeasible inference is based on normality assumptions (which may turn out to be false), although it can also include solid evidence. If we make the plausible assumption that such evidence may come from the speaker's prior experience (OB) or the current context (CE) (or perhaps both), we can make sense of the attested use conditions as requiring positive support. Notably, no contravening evidence is allowed, as such evidence would defeat the inference to the prejacent.

Finally, the use conditions of *mage*-questions mandate a combination of negative OB and positive CE. The semantics in (25) and the pertaining AI encode these use conditions quite directly. That is, the speaker's belief state entails that the question prejacent is false, hence the negative specification of OB. Moreover, the prejacent has been proposed to enter the Common Ground, so there must be shared evidence in its support, hence the positive specification of CE. This derives the particular setup of OB/CE and the concomitant sense of violated expectation.

5. Conclusion and broader implications

We argued that certain particles in Farsi convey attitudes that explain the OB/CE distribution of polar questions with these particles. In the remainder of the section, we draw some general implications that follow from our proposal.

5.1. Theory of question bias

The idea of deriving epistemic biases from speaker's attitudes simplifies the analysis of question bias in two key respects. On the one hand, it helps maintain the semantic coherence of biased question forms that exhibit a rich OB/CE distributional pattern. Take, for example, *dige*-questions. Recalling Table 2, such questions occur with positive OB, positive CE, or both. This complex pattern would be difficult to capture without the unifying factor of the inferential attitude, which has to be based on evidence, whether prior or current. Generally, the AI guarantees a unified analysis of a given question type across various settings.

On the other hand, AIs help differentiate between different question forms that display the same OB/CE distribution. For example, *ke*-questions and *dige*-questions partially overlap in their contexts of use, both being able to occur with positive OB and neutral CE. However, these forms are sharply distinguished by the AIs they carry (i.e., hope vs. inference, respectively). Similarly, *mage*-questions appear in the same contexts of use (positive OB, negative CE) as Farsi verbal tag questions, like (27).[4]

(27) Ali umad, na-yumad?
      Ali came, NEG-came
      'Ali came, didn't he?'

Yet these two forms carry different AIs: *mage*-questions express surprise, whereas verbal tag questions express doubt. The larger point is that OB/CE distribution alone is not enough to distinguish between the bias profiles of different question forms. The AI provides us with a valuable tool to draw more nuanced distinctions.

5.2. Use of discourse particles outside polar interrogatives

Our semantic proposal in (23)–(25) treats the target particles *ke*, *dige* and *mage* as propositional identity functions that introduce various attitudinal meanings in the form of conventional implicatures. While this analysis captures both Observation #1 and Observation #2, it also predicts that the very same meanings will ensue when these particles appear outside polar interrogatives. Is this prediction borne out?

The short answer is that (homophones of) our three discourse particles do appear in other clause types but the resulting interpretations seem disjoint from their interpretations in polar interrogatives. Here is a

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[4] Farsi also has tag questions formed by the particles *âre* 'Yes' and *na* 'No'. However, such tag questions exhibit a different OB/CE distribution from their verbal counterpart, requiring positive OB and positive CE. For further discussion on Farsi tag questions, see Mohammadi (2024) and Mohammadi & Romero (2024).

summary of the empirical picture. Starting with *ke*, this element doubles as a complementizer that can introduce various types of declarative clauses, including embedded clauses under attitude predicates (*ke* ≈ 'that'), non-restrictive relative clauses (*ke* ≈ 'wh-'), purpose clauses (*ke* ≈ 'so'), and result clauses (*ke* ≈ 'so'/'hence'). These uses are exemplified in (28)–(31).

(28) fekr konam ke Ali mehmuni miad.
think do that Ali party comes
'I think that Ali will come to the party.'

(29) Ali, ke tu mehmuni didiš, baradare Sara-st.
Ali who in party saw brother Sara-is
'Ali, who you saw at the party, is Sara's brother.'

(30) man mâšin xaridam ke bištar safar beram.
I car bought so more travel go
'I bought a car so I can travel more.'

(31) bârun umade ke inja xis-e.
rain came so-that here wet-is
'It has rained, so/hence it is wet here.'

The element *dige* can serve as a modifier conveying 'another', as in (32), or 'anymore', as in (33).

(32) Ali yek qazâye dige mixâd.
Ali one food another wants
'Ali wants another food.'

(33) Ali gušt ne-mixore dige.
Ali meat NEG-eats anymore
'Ali doesn't eat meat anymore.'

Finally, *mage* is found in declarative clauses with the meaning of 'unless', giving rise to a conditional interpretation, as in (34).

(34) Sara ne-myiâd, mage Ali beyâd.
Sara NEG-come unless Ali comes
'Sara wouldn't come, unless Ali comes.'

This element can also be used in wh-interrogatives to impose certain contextual restrictions (see Mohammadi 2023).

We will not speculate whether this disparity is a case of lexical polysemy or if some generalized lexical entries could derive the attested interpretations across sentence types. Here, we simply acknowledge that our proposed semantics for the target particles does extend to their apparent use outside polar interrogatives.

5.3. Division of labor between semantics and pragmatics

Looking beyond the Farsi data, it is important to ask how the proposed analytical strategy reflects on other types of biased questions, including questions without (overt) discourse particles. Let us be clear that we do not claim epistemic biases can be derived from AIs across all question forms. One case in point is various positive and negative polar questions, whose epistemic bias patterns seem robust across languages and should preferably be derived from general pragmatic principles. At the same time, our proposal about Farsi suggests that at least some components of these patterns may, in fact, be semantic in nature.

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