On Delimiting the Space of Bias Profiles for Polar Interrogatives

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Abstract. Work by Sudo (2013) and Gyuris (2017) has shown that the bias of polar interrogatives varies both cross-linguistically as well as – in languages that possess more than one interrogative structure – across clause types. We take the "bias profile" of an individual polar interrogative type to be a non-empty choice from the power sets of evidential bias options ($\wp(\{+^{ev},-^{ev},\%^{ev}\})-\{\varnothing\}$) and epistemic bias options, ($\wp(\{+^{ep},-^{ep},\%^{ep}\})-\{\varnothing\}$) for each of its expressive instantiations as positive polar question (PPQ), and negative polar questions with inside (IN-NPQ) and outside negation (ON-NPQ) in the sense of Ladd (1981). By simple extrapolation we predict the existence of $(7\times7)^3 = 117649$ such bias profiles.

Our study explores the "space" of bias profiles in a way that eclectically mixes general principles used as top-down heuristics, principles related to the discussion of bias in the literature, and some bottom-up observation-based theorizing where our small sample of bias profiles from English, Japanese, and Hungarian points in the direction of "interesting" (partial) generalizations. Throughout we calculate the "effectiveness" of our principles in the sense of stating the extent to which they reduce the space of bias profiles numerically. Our discussion then focuses on salient counterexamples to and plausible motivations for or against the most "effective" principles. Particular attention is paid to complementary choices of evidential and epistemic biases, which, encoded via the principle of *Static Complementarity* (together with *Convexity*) leads to a reduction of the space of bias profiles to just $(4\times2)^3 = 512$ permissible types.

1. Introduction

Considerable effort has gone into descriptive and theoretical characterizations of the bias that comes with uses of polar interrogatives (e.g., Büring and Gunlogson 2000; Krifka 2015; Ladd 1981; Reese 2007; Romero and Han 2004; Trinh 2014; van Rooy and Šafářová 2003). However, recent work on Japanese (Sudo 2013) and Hungarian (Gyuris 2017) – languages with more than one interrogative clause type – indicates that a complementary, cross-linguistic and cross-constructional perspective on the bias phenomena in question is called for. Such a perspective, much in line with work summarized by Matthewson (2011), is what the current brief paper attempts at providing an initial glimpse of. The speculative and programatic nature of this enterprise will be apparent throughout, not the least since we extrapolate from a rather small sample of data. Likewise, we would like to alert readers that our method is eclectic and meant to complement rather than in any way supersede the approaches above.

Starting point for our discussion of biases accompanying uses of polar interrogatives are two assumptions. First, we will follow, among others, Sudo (2013) in distinguishing "evidential" and "epistemic" bias. As for the former, imagine a situation where *A* enters *S*'s windowless office in a (manifestly) dripping wet raincoat. In such a situation it is odd for *S* to address *A* with the question in (1).

(1) S: *#Is it sunny outside?*

In other words, asking a positive polar question (PPQ) (*?p*) is infelicitous (#) in a context providing ("compelling") negative evidence, i.e., evidence supporting $\neg p$ (cf. Büring and Gunlogson 2000).[1]

[1] Working definitions are provided by Büring and Gunlogson (2000:7), according to whom *contextual evidence* is "evidence that has just become mutually available to the participants in the current discourse situation."

And, evidence *for p* is *compelling* "if, considered in isolation, it would allow the participants to assume *p* (i.e., the evidence could reasonably be considered to justify the inference that *p*)." "Evidence *against p* is *compelling* if it is compelling evidence for the opposite of *p*, *W*–*p*."

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As for the latter, assume that *S* has just learned that *A* hosted a party on the previous night but *S* has no idea who did or should have attended. Here, addressing *A* with any of the questions in (2) is odd.

(2) a. S: #*Didn't John go to the party?*
b. S: #*Did John not go to the party?*

That is, asking a negative polar question (NPQ) (*?¬p*) is odd (#) here, since it conveys *S*'s belief/expectation that *p* holds, i.e., it conveys positive epistemic bias.

Second, as demonstrated by Ladd (1981), it is important to make a distinction between "inside negation" (IN) and "outside negation" (ON) readings. One famous test for this distinction comes from the licensing of polarity sensitive items (cf., e.g., Büring and Gunlogson 2000:5; Ladd 1981:166), as shown in (3).

(3) a. *Didn't John go to the party either*?
b. *Didn't John go to the party too?*

If we have just learned that Mary didn't go to the party, it is felicitous to ask an NPQ with inside negation (IN-NPQ) by using a form such as (3a), inquiring wrt a parallel negative proposition (*?¬p*). If, on the other hand we have just learned that Mary did go to the party, it is felicitous to ask an NPQ with outside negation (ON-NPQ), like the one expressed by (3b). This brings into play a parallel positive proposition (*p*), but in an indirect way involving some kind of question force and some kind of negation (*?~p*).[2,3]

Importantly, Sudo (2013) shows that biases can change with a shift from IN-NPQs to ON-NPQs. What's more, he provides evidence that the bias of polar questions can vary both cross-linguistically (e.g., English vs. Japanese) as well as between different interrogative clause types within one and the same language (e.g., Japanese (zero marked) ∅-interrogatives vs. *no*-interrogatives). What Sudo (2013) didn't seem to realize is that, given straightforward extrapolation, we are looking at a rather interesting space of variability here. This is where our own contribution sets in.

In order to systematize the range of options we will say that each polar interrogative clause type possesses an individual "bias profile." One example of such a bias profile is provided in (4).[4]

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[2] Several treatments of outside negation have been proposed in attempts to come to grips with the peculiar pragmatic impact of this phenomenon. Seuren (1969:134f.) assumes that the question operator and negation can be fused into or replaced by an operator "SUGG ('I suggest that ...')." Reese (2007:120) allows outside negation, conceived of as some kind of integrated tag, to induce "the complex speech act type ASSERTION•QUESTION." Romero and Han (2004:636) allow outside negation to outscope the higher operator VERUM with the effect of triggering a "positive epistemic implicature" (p.640). Krifka (2015:340) takes negation in ON-NPQs to outscope a commitment operator. Finally, Krifka (2017), who provides a critical evaluation of the earlier rivaling approaches, construes outside negation as speech act denegation. As far as we can see, nothing of what follows hinges on which, if any, of these proposals is the correct one.

[3] A discussion of further tests for the IN/ON-NPQ distinction would lead us too far afield. Suffice it to mention that in German, outside negation can be unambiguously marked by exceptionally high positioning of the negative adverbial *nicht* ("not"). Thus, (i) expresses an ON-NPQ with *nicht* in a position it is not allowed to occupy in corresponding – information-structurally equivalent – declaratives, (ii).

(i) *Hätte nicht Hans in so einer Situation den Alarm auslösen sollen?*
had.SUBJ not Hans in such a situation the alarm trigger.INF shall.INF
"Shouldn't Hans have triggered the alarm in such a situation?"

(ii) *In so einer Situation hätte (*nicht) Hans (nicht) den Alarm (nicht) auslösen sollen.*
"In such a situation, Hans should not have triggered the alarm."

If *nicht* were to immediately precede *Hans* in (ii), the latter expression would have to be narrowly focused.

[4] Building on previous work by Bolinger (1957), Hudson (1975:18) speaks in more general terms of "non-conducive," "positively conducive," and "negatively conducive" uses. The three underlying "orientations"

(4) Japanese *no*-Interrogative (Sudo 2013:288)

a. PPQ: $\langle\{+^{ev}\},\{+^{ep},-^{ep},\%^{ep}\}\rangle$

b. IN-NPQ: $\langle\{-^{ev}\},\{+^{ep}\}\rangle$

c. ON-NPQ: $\langle\{+^{ev},-^{ev},\%^{ev}\},\{+^{ep}\}\rangle$

Rendered in prose, (4) says that uses of Japanese *no*-interrogatives expressing PPQs (*?p*) require contextual evidence supporting *p*, and they are compatible with the speaker believing *p*, believing ¬*p*, or being "agnostic" about whether *p* or ¬*p*. Uses of Japanese *no*-interrogatives expressing IN-NPQs (*?¬p*) require contextual evidence supporting ¬*p* and are only compatible with the speaker's (prior) belief/expectation that *p*. Finally, uses of Japanese *no*-interrogatives expressing ON-NPQs (*?~p*) are contextually unconstrained and they coincide with uses of IN-NPQs in requiring the speaker to believe or expect that *p*.[5] As one consequence, NPQs based on Japanese *no*-interrogatives would trigger the same infelicity as their English counterparts in (2).

Formally, a bias profile is a particular non-empty choice from the power sets of evidential bias options ($\wp(\{+^{ev},-^{ev},\%^{ev}\})-\{\varnothing\}$) and epistemic bias options, ($\wp(\{+^{ep},-^{ep},\%^{ep}\})-\{\varnothing\}$) for each of its expressive instantiations as PPQ, IN-NPQ, and ON-NPQ. What is striking about this is that, numerically, we predict the existence of $7^3\times7^3$ $[(7\times7)^3]$ = 117649 bias profiles for polar interrogatives. So far, we have seen only one of these, namely, the one of Japanese *no*-interrogatives in (4).

For expository purposes we will use an alternative graphical representation of bias profiles in addition to the more compact one above. (5) simply replicates (4).

(5)		{+}	{–}	{%}	{+,%}	{+,–}	{%,–}	{+,%,–}
PPQ	ev	■						
	ep							■
IN-NPQ	ev		■					
	ep	■						
ON-NPQ	ev							■
	ep	■						

Clearly, exploring the 117648 alternatives to (4)/(5) constitutes a rather daunting challenge for natural language typology. In particular, while a considerable amount of work has been done on the morphosyntax of (polar) interrogatives (cf., e.g., Dryer 2005a; Dryer 2005b; Siemund

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reemerge in our %, +, and –, respectively. An anonymous reviewer points out that work by Farkas and Roelofsen (2017) suggests that finer distinctions, and thus, more choices, may be called for.

[5] Other varieties of attitude-based biases, in particular deontic and bouletic ones, have been discussed in the literature. Reese (2007:91) argues that among NPQs, only IN-NPQs are compatible with these biases, whereas Sudo (2013:282) takes them to occur with ON-NPQs. Since our intuitions lean toward Reese's position, we leave deontic and bouletic biases out of consideration here.

However, if exceptionally high negation in German is an unambiguous indicator of ON-NPQs, as suggested in footnote 3 above, the following pair of examples, modeled on examples by Huddleston (2002:880), may actually provide (the beginnings of) an argument in favor of Sudo (2013). Utterance (i) should be taken to be addressed to a misbehaving child in the presence of her parents.

(i) *Schämen sich <u>nicht</u> deine Eltern dafür, dass Du so frech bist?*
shame self not your parents there.for that you so naughty are
"Aren't your parents ashamed that you are so naughty?"

(ii) *Vielleicht schämen sich (*<u>nicht</u>) deine Eltern (<u>nicht</u>) dafür, dass Du so frech bist.*
"Perhaps your parents aren't ashamed that you are so naughty."

2001; Ultan 1978), systematic cross-linguistic surveys of their semantico-pragmatics seem not to exist.

At the same time, we are convinced that conceptual approaches to the delimitation of the space of bias profiles can give us some insight into its shape. This is the agenda we would like to pursue in the following.

2. A Survey of Delimiting Principles

The following survey states a number of principles governing – for the most part – form-function relations and checks their validity against a small sample of bias profiles established for polar interrogatives from English, Hungarian, and Japanese by Sudo (2013) and Gyuris (2017).[6] In each case, we spell out the "effectiveness" of the principle at hand, i.e., the extent to which it reduces the space of bias profiles. As we go along, we selectively note salient counterexamples to and plausible motivations for or against the assumption of particular principles. Likewise, we discuss a few of the most prominent counterpart principles familiar from the bias literature.

More specifically, the first three (groups of) principles, i.e., *No Uniformity* (2.1), *PPQ ≠ NPQ* (2.2), and *Markedness* (2.3) are pure heuristics, *Polarity Match / QA Alignment* (2.4) closely relates to principles discussed in the literature on question-answer alignment, and *"Convexity"* (2.5), *Narrow Epistemic Choice* (2.6), and *Static Complementarity* (2.7) are "inductive" observation-based principles, derived from our sample.

Although we do not apply optimality theory directly, the principles we state have the flavor of constraints appealed to in (bidirectional) OT-semantics and -pragmatics (cf., e.g., Beaver 2004; contributions to the volume edited by Blutner and Zeevat 2004b; and Hendriks and de Hoop 2001). We must (again) stress the exploratory/programatic nature of this enterprise, where the dialectic of general principles and empirical observations should – in the long run – lead the way toward a systematic shaping of the space of bias profiles (cf. Beaver and Lee 2004 on "form-meaning mismatches"). This comes with a certain "shallowness" of reasoning, which we hope to compensate to some degree in the later discussion and outlook sections (Sections 3/4 below).

2.1 No Uniformity

Starting with an elementary constraint, we could stipulate that no bias profile be entirely uniform, i.e., that none of them consist of exactly the same choice, e.g., {+}, for each of its 6 dimensions. (6) charts this as one example of what *No Uniformity* rules out.

(6)		{+}	{–}	{%}	{+,%}	{+,–}	{%,–}	{+,%,–}
PPQ	ev							
	ep							
IN-NPQ	ev							
	ep							
ON-NPQ	ev							
	ep							

In fact, *No Uniformity* is valid in our small sample. Of course, the resulting overall numerical reduction of the space of bias profiles would be negligible (117649–7 = 117642). In addition,

[6] The full sample can be found in Appendix A. Yasu Sudo informs us that recent work by Ito and Oshima (2016) should be taken into account for a fuller understanding of the Japanese facts.

it isn't even entirely obvious why languages shouldn't, for example, have some "all purpose" polar interrogatives displaying {+,–,%} everywhere.[7]

2.2 PPQ ≠ NPQ

Intuitively more plausible than *No Uniformity* is a principle saying that negation should have an impact on bias, abbreviated here as *PPQ ≠ NPQ* (interpreted more precisely as $PPQ^{ev} \neq NPQ^{ev}$ & $PPQ^{ep} \neq NPQ^{ep}$). This kind of thinking can, to pick one of the more seldom cited sources, already be found with Hudson (1975:17f.). (7) gives an example of what *PPQ ≠ NPQ* rules out.

(7)		{+}	{–}	{%}	{+,%}	{+,–}	{%,–}	{+,%,–}
PPQ	ev							
	ep							
IN-NPQ	ev							
	ep							
ON-NPQ	ev							
	ep							

Particular choices (grey shading) of PPQ^{ev} and PPQ^{ep} make the corresponding choices of IN/ON-NPQ^{ev} and IN/ON-NPQ^{ep} impossible (black shading). Numerically, *PPQ ≠ NPQ* reduces the space of options by almost one half ($7^2 \times 6^2 \times 6^2 = 63504$).

However, this constraint is contradicted by the evidential "anti-bias" of Hungarian *e*-interrogatives (Gyuris 2017). Here both PPQ and ON-NPQ require neutral contexts, {$\%^{ev}$}.[8] Thus, (8) would both be incompatible with the scenario in (1) as well as its opposite, e.g., a situation in which *A* comes in with dark sunglasses, wearing T-shirt, shorts, and a straw hat, carrying a bottle of suntan lotion, humming "You are the sunshine of my life," etc.

(8) S: #*Süt-e a nap?* [Hungarian]
shine-Q the sun
"Is it sunny?"

To make the corresponding case for ON-NPQs, one may imagine a scenario in which *S* and *A* stand in front of a billboard in a small village saying that the last restaurant there has just closed for good. Here it is odd to use the ON-NPQ in (9a). Likewise, in the opposite scenario where the billboard announces the opening of several new restaurants in that village, it is equally odd to use the ON-NPQ in (9b).

[7] The choice between PPQ and IN-NPQ could be purely "stylistic." We are not sure that this makes equal sense for the choice between IN-NPQ and ON-NPQ.

[8] The evidential "anti-bias" of PPQs expressed by *e*-interrogatives plays a major role in formal genre-specific "strategic" language use. Thus, for example, a registrar presiding over a wedding ceremony will use a formula like (i), in spite of the fact that from the point of view of common sense, the presence of the couple to be married is "compelling" evidence in favor of a positive answer (http://corpus.nytud.hu/mnsz/, Hungarian National Corpus,).

(i) *Kijelenti-e ön , T.R., hogy az itt jelenlévő vőlegényével, ..., házasságot köt?*
declare-Q you that the here present fiancé.your.with marriage.ACC bind
"Do you, R.T., declare that you wish to marry your fiancé, ..., who is present here?"

(9) a. S: #*Nincs-e itt egy francia étterem?* [Hungarian]
not.is-Q here a French restaurant
"Isn't there a French restaurant here?"
b. S: #*Nincs-e itt egy étterem?*
"Isn't there a restaurant here?"

In the absence of the kind of "compelling" positive or negative evidence just discussed, Hungarian *e*-interrogatives can be used to express ON-NPQs conveying that one expects *p* to be the case, i.e., they come with positive epistemic bias. Their full bias profile is given in (10).

(10) Hungarian *e*-Interrogative (Gyuris 2017: Section 4)[9]
a. PPQ: $\langle\{\%^{ev}\},\{+^{ep},-^{ep},\%^{ep}\}\rangle$
b. ~~IN-NPQ:~~
c. ON-NPQ: $\langle\{\%^{ev}\},\{+^{ep}\}\rangle$

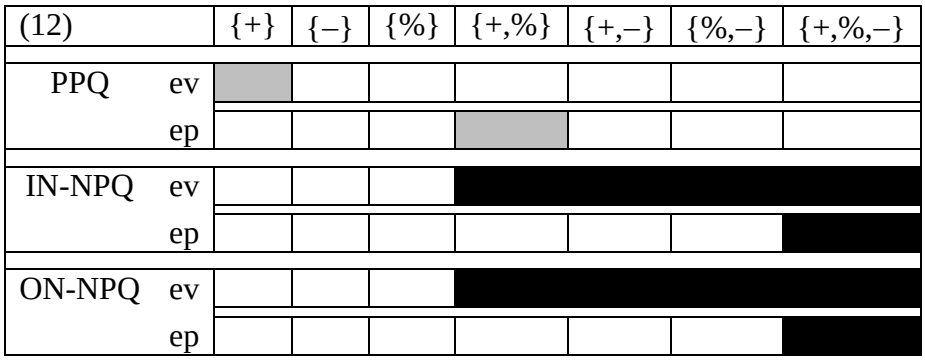
2.3 Markedness

2.3.1 Quantitative Markedness

One may also hypothesize that expressing marked, here negative, meanings (*?¬p*/*?~p*) does not lead to more options than expressing their unmarked, positive, counterpart, i.e., $|\underline{\text{PPQ}}| \geq |\underline{\text{NPQ}}|$.[10] Depending on whether or not one wants to treat epistemic and evidential choices separately, this constraint can be interpreted "distributively," (11a), or "collectively," (11b).

(11) a. $|\underline{\text{PPQ}}^{ev}| \geq |\underline{\text{IN-NPQ}}^{ev}|$ & $|\underline{\text{PPQ}}^{ev}| \geq |\underline{\text{ON-NPQ}}^{ev}|$ &
$|\underline{\text{PPQ}}^{ep}| \geq |\underline{\text{IN-NPQ}}^{ep}|$ & $|\underline{\text{PPQ}}^{ep}| \geq |\underline{\text{ON-NPQ}}^{ep}|$
b. $|\underline{\text{PPQ}}^{ev}|+|\underline{\text{PPQ}}^{ep}| \geq |\underline{\text{IN-NPQ}}^{ev}|+|\underline{\text{IN-NPQ}}^{ep}|$ &
$|\underline{\text{PPQ}}^{ev}|+|\underline{\text{PPQ}}^{ep}| \geq |\underline{\text{ON-NPQ}}^{ev}|+|\underline{\text{ON-NPQ}}^{ep}|$

"Distributive" *Quantitative Markedness* cuts the space of options to almost one quarter, leaving 33856 possible bias profiles. "Collective" *Quantitative Markedness* results in reducing possibilities to 56536, i.e., to less than one half of the original number.[11] (12) and (13) present examples of what the two versions of *Quantitative Markedness* rule out.



[9] IN-NPQs cannot be expressed (See Section 3.1.1 below).
[10] Through underlining we indicate that we are talking about the set of bias choices pertaining to the expressive option in question. Thus, wrt (4), PPQ denotes the set $\{+^{ev},+^{ep},-^{ep},\%^{ep}\}$ (i.e., $\{+^{ev}\} \cup \{+^{ep},-^{ep},\%^{ep}\}$).
[11] The calculations are given in Appendix B.

(13)		{+}	{–}	{%}	{+,%}	{+,–}	{%,–}	{+,%,–}
PPQ	ev							
	ep							
IN-NPQ	ev							
	ep							
ON-NPQ	ev							
	ep							

Now, in fact, "collective" *Quantitative Markedness*, (11b)/(13), is valid in our sample. As an example, (14) provides the bias profile of English V1-interrogatives, i.e, standard polar interrogatives with "Subject-Auxiliary-Inversion."

(14) English V1-Interrogative (Sudo 2013:284)[12]
- a. PPQ: $\langle\{+^{ev},\%^{ev}\},\{+^{ep},-^{ep},\%^{ep}\}\rangle$
- b. IN-NPQ: $\langle\{-^{ev}\},\{+^{ep}\}\rangle$
- c. ON-NPQ: $\langle\{-^{ev},\%^{ev}\},\{+^{ep}\}\rangle$

By contrast, although "distributive" *Quantitative Markedness*, (11a)/(12), is largely valid in our sample as well, it is violated, for example, by the evidential bias of Japanese *no*-interrogatives. As shown in (4), $|\underline{\text{PPQ}}^{ev}| < |\underline{\text{ON-NPQ}}^{ev}|$.

2.3.2 Qualitative Markedness

On a content-based approach to markedness, one may assume that {%} is the unmarked context. *Qualitative Markedness* could then say that $\{\%^{ev}\}$ requires PPQ and blocks NPQs. This intuition has been appealed to by Trinh (2014:230) in the following constraint:

(15) NEUTRAL QUESTION
In contexts where there is neither evidence for p nor evidence for W\p,
the question {p,W\p} is felicitous only if it is an inverted positive question.

The effect of *Qualitative Markedness* is shown in (16).

(16)		{+}	{–}	{%}	{+,%}	{+,–}	{%,–}	{+,%,–}
PPQ	ev							
	ep							
IN-NPQ	ev							
	ep							
ON-NPQ	ev							
	ep							

However, as can be gathered from (14c), English V1-interrogatives expressing ON-NPQs constitute one of the counterexamples here.[13]

[12] $|\underline{\text{PPQ}}^{ev}|+|\underline{\text{PPQ}}^{ep}| = 5$; $|\underline{\text{IN-NPQ}}^{ev}|+|\underline{\text{IN-NPQ}}^{ep}| = 2$; $|\underline{\text{ON-NPQ}}^{ev}|+|\underline{\text{ON-NPQ}}^{ep}| = 3$.

[13] Curiously, Trinh (2014:244) disputes the pertinent evidence.

If, for the sake of completeness, we assume further that "ignorance," {%^{ep}}, is the unmarked belief state, which likewise requires PPQ and blocks NPQs, (generalized) *Qualitative Markedness* would be compatible with just $4^2\times3^2\times3^2 = 1296$ bias profiles.

2.4 Polarity Match / Q(uestion)A(nswer) Alignment

Let's consider another constraint, one that demands that the polarity of a question type and its bias options have to show a certain match. Under a simple interpretation of this constraint, two extreme cases would be ruled out: (a) the evidential or the epistemic bias of any PPQ being just {−}, and (b) the evidential or the epistemic bias of any NPQ being just {+}. In other words, (this version of) *Polarity Match* would require that the polarity of the question and the direction of the bias don't totally contradict each other. (17) shows the resulting incompatibilities. The number of bias profiles would be cut down to $(6\times6)^3 = 46656$, i.e., it would be reduced by well over one half.

(17)		{+}	{−}	{%}	{+,%}	{+,−}	{%,−}	{+,%,−}
PPQ	ev		■					
	ep		■					
IN-NPQ	ev	■						
	ep	■						
ON-NPQ	ev	■						
	ep	■						

Requirement (a) is valid according to our sample, while (b) seems to be violated quite regularly by NPQs displaying {+^{ep}} (see Section 2.6 below).

Polarity Match is closely related to principles taken to govern the alignment of the polarity of questions and (preferred) answers (e.g., AnderBois 2011; Farkas and Bruce 2010; Roelofsen and Farkas 2015; van Rooy and Šafářová 2003), whence the alternative designation *Q(uestion)A(nswer)Alignment*. AnderBois (2011:118), for example, introduces the principle of "bias to the overt" to capture this kind of alignment.[14] However, (equivalents of) *Avoid Disagreement* (− ∉ PPQ; + ∉ NPQ), or *Don't Rule Out Agreement* (+ ∈ PPQ; − ∈ NPQ) are equally falsified, for example, by the bias profiles of Japanese *no*-interrogatives, (4). Since their numerical impact on reducing the space of bias profiles is quite substantial, we illustrate these constraints below.

[14] The principle restates van Rooy and Šafářová's (2003) suggestion that "POSQs [PPQs] convey bias towards the positive answer; ALTQs [alternative questions] convey the speaker's neutrality; and LONEGQs [IN-NPQs] convey bias towards the negative answer" (AnderBois 2011:118). Similar statements are provided under the heading of "Avoid Reverse" by Roelofsen and Farkas (2015:402), (i) (cf. "Avoid Reversing Responses" by Roelofsen, Venhuizen and Weidman Sassoon 2012:466), and "Prejacent Compatibility" by Trinh (2014:229), (ii).

(i) AVOID [REVERSE]: Other things being equal, formulate your initiative in such a way as to minimize the chance of eliciting a [REVERSE] response.

(ii) PREJACENT COMPATIBILITY: A yes/no question is felicitous only if its prejacent does not contradict the answer implied by contextual evidence.

An anonymous reviewer points out that the predictions of "Avoid Reverse" are actually different from what our exposition may suggest, due to *¬p* rather than *p* being the "reverse" answer to *?~p*.

(18)		{+}	{–}	{%}	{+,%}	{+,–}	{%,–}	{+,%,–}
PPQ	ev		■			■	■	■
	ep		■			■	■	■
IN-NPQ	ev	■			■	■		■
	ep	■			■	■		■
ON-NPQ	ev	■			■	■		■
	ep	■			■	■		■

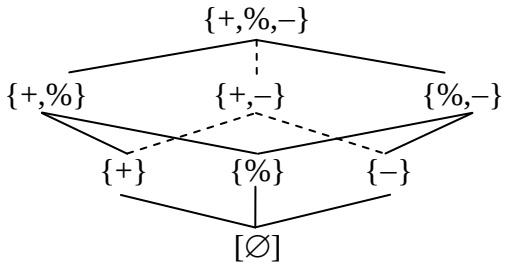
(19)		{+}	{–}	{%}	{+,%}	{+,–}	{%,–}	{+,%,–}
PPQ	ev		■	■			■	
	ep		■	■			■	
IN-NPQ	ev	■		■	■			
	ep	■		■	■			
ON-NPQ	ev	■		■	■			
	ep	■		■	■			

As shown in (18) and (19) respectively, *Avoid Disagreement* leaves $3^6 = 729$ options, *Don't Rule Out Agreement* $4^6 = 4096$.

*2.5 *{+,–} ("Convexity")*

Both $\{+^{ev},-^{ev}\}$ and $\{+^{ep},-^{ep}\}$ are absent from our sample. This could be interpreted as a convexity constraint, which becomes more clearly visible if the bias options are arranged in form of the following Hasse-diagram. *Convexity* amounts to ruling out crossing lines.

(20)



As with *Polarity Match*, the number of bias profiles compatible with **{+,–}* is $(6\times6)^3 = 46656$.

Now, to the extent that convexity is an important explanatory principle in the domain of "conceptual spaces" and their applications to natural language semantics (Gärdenfors 2014), the above observation is at least interesting. Yet, it is not entirely obvious that **{+,–}* should hold. Thus, assuming a (strict) "division of pragmatic labor" in the sense of Horn (1984) (cf. Blutner and Zeevat 2004a), one would falsely predict $\{+^{ev},-^{ev}\}$ for the Hungarian (prosodically marked "fall-rise") /\-interrogative (see [5], Appendix A), given that – as mentioned in Section 2.2 – the rivaling *e*-interrogative comes with "anti-bias," i.e., $\{\%^{ev}\}$ (cf. Gyuris 2017).

2.6 Narrow Epistemic Choice ({+^{ep}} or {+^{ep},–^{ep},%^{ep}})

Our sample suggests that the number of epistemic bias options is rather narrow, that is, we predominantly find {+^{ep}} or {+^{ep},–^{ep},%^{ep}}. A putative constraint encoding this, *Narrow Epistemic Choice*, would result in a space of just $(7\times2)^3 = 2744$ bias profiles. Note that in line with *Quantitative Markedness* (Section 2.3.1 above), {+^{ep}} is chosen by NPQs while PPQs come with {+^{ep},–^{ep},%^{ep}}.

The only exception to *Narrow Epistemic Choice* are Japanese *desho*-interrogatives, where both IN- and ON-NPQ select {–^{ep}} (Sudo 2013:290f.) (see Section 3.1.1 below).

2.7 Static Complementarity

Our final delimiting principle builds on the two previous ones, i.e., *Narrow Epistemic Choice* and *Convexity*. Thus, while instantiations of epistemic bias options tend to be just {+} or {+,–,%}, evidential bias options go for the remaining specifications except {+,–}, i.e., {+,%}, {%,–}, {%}, and {–}. (21) shows the configuration resulting from *Static Complementarity* and *Convexity*.

(21)		{+}	{–}	{%}	{+,%}	{+,–}	{%,–}	{+,%,–}
PPQ	ev	■				■		■
	ep		■	■	■	■	■	
IN-NPQ	ev	■				■		■
	ep		■	■	■	■	■	
ON-NPQ	ev	■				■		■
	ep		■	■	■	■	■	

Static Complementarity together with *Convexity* leaves the considerably reduced number of $(4\times2)^3 = 512$ bias profiles. Even if it involves some idealization, complementarity calls for an investigation of underlying explanatory factors.[15] At the same time, counterexamples like the epistemic bias of Japanese *desho*-interrogatives (IN-/ON-NPQ selects {–^{ep}}) and the evidential bias of Japanese *no*-interrogatives (PPQ selects {+^{ev}}, ON-NPQ selects {+^{ev},–^{ev},%^{ev}}), see (4), require closer scrutiny. These issues will be among the things addressed in the following discussion in Section 3.

3. Discussion

3.1 "Effective" Constraints

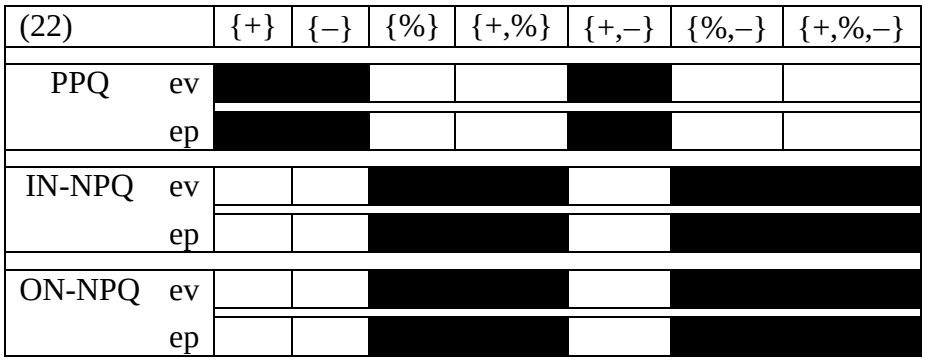
We will begin our discussion by revisiting those constraints from Section 2 that bring about the largest reductions of the space of bias profiles. The main objective will be to discuss the nature of counterexamples to these constraints in order to further our understanding of the scope and validity of the ideas underlying the constraints. At the same time we hope to be able to shed some additional light on the natural language constructions involved.

3.1.1 (Generalized) Qualitative Markedness

As stated at the end of Section 2.3.2, a generalization of *Qualitative Markedness* would take {%} to be the unmarked evidential and epistemic "environment," which requires choice of

[15] From a theoretical point of view, a more flexible principle of *Dynamic Complementarity* might be envisaged. Here, all that is required is that evidential and epistemic biases within the bias profile of an individual polar interrogative do not overlap.

PPQs and blocks NPQs. (22) adds the epistemic dimension to (16) to represent *Generalized Qualitative Markedness*.



As mentioned in Section 2.3.2, the accordingly reduced space of bias profiles contains only $4^2 \times 3^2 \times 3^2 = 1296$ members.

As for counterexamples to (22), two cases are particularly noteworthy. In one case, namely, Japanese *desho*-interrogatives, PPQs are limited to $\{+^{ep}\}$ in the epistemic domain to the exclusion of $\%^{ep}$. In the other, ON-NPQs expressed by Hungarian *e*-interrogatives are confined to what is supposed to be the marked evidential choice for NPQs, i.e., $\{\%^{ev}\}$.

The bias profile of Japanese *desho*-interrogatives is provided in (23).

(23) Japanese *desho*-Interrogative (Sudo 2013:290)

a. PPQ: $\langle\{+^{ev},-^{ev},\%^{ev}\},\{+^{ep}\}\rangle$
b. IN-NPQ: $\langle\{+^{ev},-^{ev},\%^{ev}\},\{-^{ep}\}\rangle$
c. ON-NPQ: $\langle\{-^{ev},\%^{ev}\},\{-^{ep}\}\rangle$

The narrow positive epistemic bias of PPQs here could be explained on the assumption that *desho*-interrogatives do what English declaratives with added tags like *right?* or *correct?* do (cf., e.g., Asano-Cavanagh 2011:465). Thus when *S* is convinced that *A* is hungry, *S* can express this as in (24a). And (24b) shows that this line of thinking nicely explains the opposite epistemic value of IN-NPQs too.

(24) a. S: *You are hungry, right?*
b. S: *You aren't hungry, right?*

Likewise, as discussed by Gyuris (2017), Hungarian *e*-interrogatives – their bias profile is given in (10) (Section 2.2) – come with an evidential "anti-bias" ($\{\%^{ev}\}$) comparable to the one of explicitly disjunctive questions. Thus, the pragmatic infelicity (#) of (8) in the compelling-evidence-for-rain and compelling-evidence-for-sunshine scenarios is equally displayed by disjunctions of polar opposites in English V1-interrogatives.

(25) a. S: *Is it raining or isn't it?*
b. S: *Is it sunny or isn't it?*

What is special about Hungarian *e*-interrogatives is that this evidential "anti-bias" is preserved when ON-NPQs are used. This can be accounted for by assuming that (i) *-e* is some kind of structurally "incorporated" disjunction[16] and (ii) that ON-NPQs – at least in cases like the one

[16] As pointed out by Gyuris (2017:50), Chinese A-not-A interrogatives can be taken to show comparable grammatical and pragmatic properties (cf. Hagstrom 2006). Among other things, the curious ban on the

at hand – are internally like PPQs, the additional effect of "outside negation" coming into play at the speech act level only (for detailed discussion, see Gyuris 2017).

The general upshot of these observations is that Japanese *desho*-interrogatives and Hungarian *e*-interrogatives are themselves marked forms, in competition with other interrogative clause types in their respective languages. On this premise, their being able to violate global "soft" constraints like *Generalized Qualitative Markedness* is not inconsistent with current thinking about corresponding phenomena.[17]

3.1.2 Polarity Match / QA Alignment

In terms of numerical restrictiveness, our specializations of *Polarity Match* (Section 2.4 above), i.e., *Avoid Disagreement* and *Don't Rule Out Agreement*, are highly "effective." The former yields a space of just $3^6 = 729$ bias profiles, the latter $4^6 = 4096$.

Note to begin with that the somewhat enigmatic constraint **{+,–} ("Convexity")* (Section 2.5) follows from *Avoid Disagreement*. As (18) shows, for PPQs the choice of {+,–} would violate the condition that $- \notin \underline{\text{PPQ}}$ and for NPQs it would be in conflict with the requirement that $+ \notin \underline{\text{NPQ}}$.

However, both *Avoid Disagreement* and *Don't Rule Out Agreement* are utterly inconsistent with *Narrow Epistemic Choice* (Section 2.6), which is derived from empirical observation. Thus, $\{+^{ep}\}$ is a standard bias of NPQs across languages. In our sample, English V1-interrogatives (IN/ON-NPQ), (14), Japanese *no*-interrogatives (IN/ON-NPQ), (4), Hungarian /\-interrogatives (IN/ON-NPQ), [5] (Appendix A), Japanese ∅-interrogatives (ON-NPQ), [2] (Appendix A), and Hungarian *e*-interrogatives (ON-NPQ), (10), have that value. The opposite choice of $\{-^{ep}\}$ for Japanese *desho*-interrogatives, (23), has just been motivated when discussing (24) (Section 3.1.1 above). This inconsistency makes sense, of course, if we assume that the (projected) "agreement" and "disagreement" at stake here are "objective" or "intersubjective" states to be established on the basis of information mutually available to the interlocutors. It then follows that evidence fed into the common ground is privileged over (private) speaker beliefs/expectations in driving what AnderBois (2011:118) calls "bias to the overt": "overt" utterances match evidential bias, which, arguably, raises the overall probability of triggering matching responses in turn.[18]

We can conclude that (varieties of) *Polarity Match* are best thought of as only constraining evidential biases.[19]

Additionally it has to be pointed out that *Avoid Disagreement* is, but *Don't Rule Out Agreement* isn't compatible with the previously discussed evidential "anti-bias" ($\{\%^{ev}\}$) of Hungarian *e*-interrogatives, (10). This would speak in favor of the former constraint, since, quite plausibly, questions of unbiased information seeking should be able to be part of any "communicative act repertoire," and special interrogatives encoding just this function should not be ruled out *a priori*.

3.1.3 Static Complementarity

As stated at the end of Section 2.7, *Static Complementarity* together with *Convexity* reduces the number of bias profiles to $(4\times2)^3 = 512$. We have just seen in the previous section that there is an asymmetry between evidential and epistemic biases concerning objectivity/intersubjectivity vs. subjectivity and how that is reflected in "overt" utterances.

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expression of IN-NPQs by Hungarian *e*-interrogatives might be derivable, if the structure *-e* combines with encodes the non-negative "A part" of such an interrogative.

[17] See the contributions to the volume edited by Blutner and Zeevat (2004b) for ample illustration.

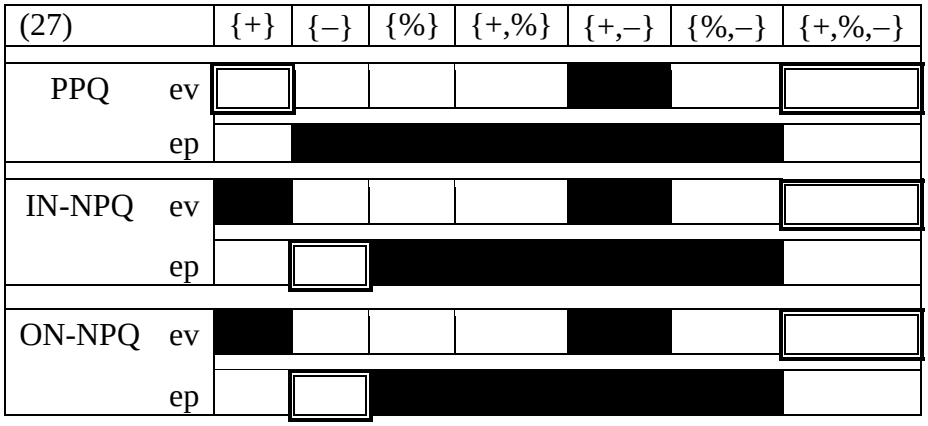
[18] This kind of reasoning could clearly be made more precise within a game- or decision-theoretic setting, such as proposed by van Rooy (2003) and van Rooy and Šafářová (2003).

[19] Thus, deriving *Convexity* from *Avoid Disagreement* only makes sense wrt $\{+^{ev},-^{ev}\}$, as does the fact that *Convexity* is formally always compatible with *Don't Rule Out Agreement*.

This may well be a major source for complementarity. However, rather than speculate any further here, let's have a look at counterexamples to this compound constraint.

Our sample provides 6 – out of 36 possible – violations of (21), all of them deriving from either Japanese *no*-interrogatives or *desho*-interrogatives. They are given in (26), and (27) graphically represents the locations of these violations (bold double-lined cell borders).

(26) a. Ja. *no*-int.: PPQ $\{+^{ev}\}$ / ON-NPQ $\{+^{ev},-^{ev},\%^{ev}\}$
b. Ja. *desho*-int.: PPQ $\{+^{ev},-^{ev},\%^{ev}\}$ / IN-NPQ $\langle\{+^{ev},-^{ev},\%^{ev}\},\{-^{ep}\}\rangle$ / ON-NPQ $\{-^{ep}\}$



Three of these violations, namely, the ones caused by Japanese *desho*-interrogatives expressing PPQs or IN-NPQs, can be accounted for if the line of reasoning given in Section 3.1.1 is valid and these clauses behave like English *declaratives* plus tagged on *right?* or *correct?*, (24). All one has to add it that *desho*-interrogatives give expression to and check a strong hunch on part of the speaker irrespective of the evidence, hence compatibility with $\{+^{ev},-^{ev},\%^{ev}\}$. We are, however, unable to see how this could apply to ON-NPQs as well.

A way of making sense of $\{+^{ev}\}$ with Japanese *no*-interrogatives expressing PPQs would be to postulate some mirative component ("being struck by the evidence"), which would assimilate them to (exclamatorily used) declaratives. Thus, in the compelling-evidence-for-rain scenario, both (28a) and (28b) express what we have in mind.

(28) a. S: *Oh, wow! Is it raining?!*
b. S: *Oh, wow! It's raining!*

This would also fit with *no*-interrogatives expressing IN-NPQs, whose specification $\langle\{-^{ev}\},\{+^{ep}\}\rangle$, (4b), suggests that they convey speaker incredulity in addition, perhaps like English *really*. This can be substantiated by (29), taken to be uttered in a situation where *S* has just found out that the Netherlands did not beat Iceland in soccer.

(29) S: *Oh, wow! Did the Netherlands really not beat Iceland?!*

In sum, what we seem to find is that violations of *Static Complementarity* come about where interrogatives begin to functionally overlap with declaratives.

3.2 Interrogatives: Specialized, Modified, and Substituted

We have already seen that an investigation of bias profiles for polar interrogatives is intimately linked with an investigation of the formal inventory of polar interrogatives. Likewise – and this is a well-known background assumption of research into sentence types and their functions (cf. Davis 2011; Zimmermann 2011, and references cited there) – particles

play an important role in modifying the use conditions of interrogatives. And finally, more marginal uses of interrogatives are often close to uses of related sentence types, declaratives and exclamatives being the most relevant neighbors for polar interrogatives here. It goes without saying that these three issues and their intrinsic connections cannot be treated in any depth here. Instead we'll illustrate each point by one or two examples that link up to the previous discussion.

3.2.1 German ob*-Verb-Final Interrogatives*

It is well-known that German polar interrogatives come in a standard verb-initial (V1-interrogative), (30a), and a verb-final variety introduced by *ob* ("whether") (*ob*-VF-interrogative), (30b).

(30) a. *Regnet es?*
rains it
"Does it rain?"

b. *Ob es (wohl) regnet?* [German]
whether it PRT rains
"Does it rain? (I wonder.)"

As pointed out in the recent literature (e.g., Truckenbrodt 2006; Zimmermann 2013), *ob*-VF-interrogatives are limited to situations where questions are posed as issues for speculation (cf. Lyons 1977:755) rather than asked. Such "reflective questions" – and hence *ob*-VF-interrogatives – seem to come with a particular requirement on evidential bias, namely, that it be neutral ({%^{ev}}). Thus, using (30b) would be infelicitous in the compelling-evidence-for/against-rain scenarios discussed in (1) and (8) above.[20] As far as we can see, this effect does not depend on whether *ob*-VF-interrogatives express PPQs, as in (30b), or IN-NPQs and ON-NPQs.

3.2.2 Hungarian vajon

German *ob*-VF-interrogatives are regularly accompanied by the (modal) particle *wohl*, which marks an assertion as speculative in declaratives and invites speculative answers/responses in interrogatives (cf. Zimmermann 2011). In Hungarian, "reflectivity" is directly induced by inserting the particle *vajon* into interrogatives (cf. Farkas and Bruce 2010; Gärtner and Gyuris 2012). Since, as we have seen, *e*-interrogatives independently come with evidential anti-bias, cf. (10), the effect should be tested with Hungarian /\-interrogatives. Thus, like (30b), utterances of (31) are incompatible with compelling-evidence-for/against-sunshine.

(31) *Vajon süt a nap /\?* [Hungarian]
PRT shine the sun
"Is it sunny? (I wonder.)"

Without *vajon*, (31) would be allowed under compelling evidence for sunshine, i.e., in the scenario discussed in (8) above. Thus, the {+^{ev},%^{ev}}-specification for PPQs expressed by Hungarian /\-interrogatives is switched to {%^{ev}} by particle insertion.

3.2.3 Incredulity and Mirativity

Particles may sometimes be indicative of specific combinations of evidential and epistemic biases. Thus, where evidence clashes with (firm) speaker beliefs, inserting a particle like *really* – as already mentioned in connection with (29) in Section 3.1.3 above – serves the purpose of conveying disbelief ("incredulity") and double-checking. Thus, imagine the

[20] In order to meet the "reflectivity" requirement, it would be more natural to assume that the person coming into the room bearing the wet raincoat or sunglasses etc. (*A*) is not the interlocutor. Instead, *S* either speaks to herself or addresses another person (*B*) who can't see or hasn't yet seen *A* and thus is not aware of the crucial evidence.

compelling-evidence-for-rain scenario in (1) transferred to a desert region. Here, (32) signals a $+^{ev}/-^{ep}$-context.

(32) S: *Is it really raining?*

Without *really*, no inference about the speaker's epistemic bias could be drawn.

The component of suprise ("miratívity") (cf. Section 3.1.3) that may accompany utterances of (32) could equally naturally be conveyed through uses of (prosodically) "rising declaratives" (cf. Gunlogson 2003) instead of interrogatives. This is indicated in (33).

(33) S: *It is raining* (/)*?!*

The upshot of these short remarks is that the investigation of (the space of) bias profiles ultimately has to be broadened and integrated with systematic studies of particles and sentence types.

4. Summary and Outlook

Following Sudo (2013), we have assumed that the bias accompanying uses of polar interrogatives varies according to whether (i) it is evidential or epistemic and (ii) whether the interrogative expresses a positive polar question (PPQ), a negative polar question with inside (propositional) negation (IN-NPQ), or a negative polar question with outside negation (ON-NPQ). Assuming further that bias can be positive (+) – having compelling evidence for *p* or believing/expecting that *p*, negative (–) – having compelling evidence for $\neg p$ or believing/expecting that $\neg p$, or neutral (%) – lacking compelling evidence for either *p* or $\neg p$ or being "agnostic" about whether *p* or $\neg p$, we have defined a "bias profile" for a polar interrogative clause type to be a particular non-empty choice from the power sets of evidential bias options ($\wp(\{+^{ev},-^{ev},\%^{ev}\})-\{\varnothing\}$) and epistemic bias options, ($\wp(\{+^{ep},-^{ep},\%^{ep}\})-\{\varnothing\}$) for each of its expressive instantiations as PPQ, IN-NPQ, and ON-NPQ. The bias profile of Japanese *no*-interrogatives in (4) (Section 1 above) is repeated here for convenience.

(4) Japanese *no*-Interrogative (Sudo 2013:288)

a. PPQ: $\langle\{+^{ev}\},\{+^{ep},-^{ep},\%^{ep}\}\rangle$
b. IN-NPQ: $\langle\{-^{ev}\},\{+^{ep}\}\rangle$
c. ON-NPQ: $\langle\{+^{ev},-^{ev},\%^{ev}\},\{+^{ep}\}\rangle$

As a matter of simple numerical extrapolation, we have observed that $7^3\times7^3$ $[(7\times7)^3]$ = 117649 such bias profiles are predicted to exist. We take this result as non-trivial in the sense that beyond the six instantiations from English, Hungarian, and Japanese discussed here (see Appendix A), hardly anything is known about the "space" of bias profiles.

In Sections 2 and 3 we have opted for an exploration of the space of bias profiles that mixes general principles used as top-down heuristics – *No Uniformity* (Section 2.1), *PPQ ≠ NPQ* (2.2), and *Markedness* (2.3) –, principles related to the discussion of bias in the literature – *Polarity Match / QA Alignment* including *Avoid Disagreement* and *Don't Rule Out Agreement* (2.4) –, and some bottom-up observation-based theorizing where our small sample points in the direction of "interesting" (partial) generalizations – *"Convexity"* (2.5), *Narrow Epistemic Choice* (2.6), and *Static Complementarity* (2.7). Throughout we have indicated the "effectiveness" of the principles at hand, i.e., the extent to which they reduce the space of bias profiles. Much of our discussion therefore has focused on evaluating salient counterexamples to and plausible motivations for or against the most "effective" principles: *(Generalized)*

Qualitative Markedness, which reduces the space of bias profiles to $4^2 \times 3^2 \times 3^2 = 1296$ possible types (Sections 2.3.2 and 3.1.1), *Avoid Disagreement* and *Don't Rule Out Agreement*, compatible with $3^6 = 729$ and $4^6 = 4096$ bias profiles, respectively (Sections 2.4 and 3.1.2), and *Static Complementarity* plus *Convexity*, the constraint configuration that limits the number of bias profiles to just $(4 \times 2)^3 = 512$ (Sections 2.5, 2.7, and 3.1.3).

Concerning *Generalized Qualitative Markedness*, i.e., association of the unmarked expressive PPQ types with the unmarked evidential and epistemic "environment" {%}, we have noted that the main counterexamples arise as a variety of "markedness reversal" where clause types themselves are marked (Section 3.1.1). As for privileged links between PPQs/NPQs and {+}/{−}-values captured by *Avoid Disagreement* and *Don't Rule Out Agreement*, we have found that this applies predominantly at the evidential level. We have interpreted this as confirming the intuition that the (projected) "agreement" and "disagreement" at stake in the underlying *Q(uestion)A(nswer) Alignement* are "objective" or "intersubjective" states to be established on the basis of information mutually available to the interlocutors. It then follows that evidence fed into the common ground is privileged over (private) speaker beliefs/expectations. and we arrive at what AnderBois (2011:118) calls "bias to the overt": "overt" utterances match evidential bias (Section 3.1.2). We have also seen that the main violations of *Static Complementarity* – evidential biases limited to $\{+^{ev},\%^{ev}\}$, $\{-^{ev},\%^{ev}\}$, $\{\%^{ev}\}$, and $\{-^{ev}\}$ / epistemic biases instantiated only as $\{+^{ep}\}$ or $\{+^{ep},-^{ep},\%^{ep}\}$ – arise where interrogative clauses functionally overlap with declaratives (Section 3.1.3).

The current investigation has put the space of bias profiles for polar interrogatives on the agenda, but we have – very briefly – sketched in Section 3.2 how interaction with particles and competition among specialized interrogatives and other clause types can influence individual bias profiles. We hope that the kind of systematicity faintly visible from our approach to interrogatives will scale up to eventual coverage of that larger domain. But only further large-scale cross-linguistic investigation can tell.

At the same time, we have stressed from the outset that we take our approach to complement rather than in any way supersede proper semantic and pragmatic analyses of bias. Among the many questions of convergence we have left open, the issues arising from *Static Complementarity* are perhaps the most challenging ones. Clearly, evidential and epistemic biases are dependent on each other in non-trivial ways. Full scale systematic testing of the resulting combinatorics where sets of options are available – $\langle\{+^{ev},\%^{ev}\},\{+^{ep},-^{ep},\%^{ep}\}\rangle$ of PPQs expressed by English V1-interrogatives, (14), and Hungarian /\-interrogatives (Appendix A) being the richest examples – are high on the agenda for further research (cf. Roelofsen, Venhuizen and Weidman Sassoon 2012).[21]

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[21] Roelofsen, Venhuizen and Weidman Sassoon (2012) present experimental evidence on interaction between epistemic and evidential biases of English polar interrrogatives. Most importantly, their results indicate that epistemic bias for the positive answer ($\{+^{ep}\}$) may license PPQs in negative contexts ($\{-^{ev}\}$), contrary to Sudo's findings reported in (14) (Section 2.3.1 above). However, this effect might be due to the experimental set-up, where (i) unambiguous classification of contexts isn't always guaranteed – as the authors themselves note (p.460) – and (ii) linguistic presentation of contextual evidence may have influenced the naturalness of responses/reactions.

Appendix A: Six Bias Profiles

[1] English V1-Interrogative (Sudo 2013:284) [=(14)]

a. PPQ: $\langle\{+^{ev},\%^{ev}\},\{+^{ep},-^{ep},\%^{ep}\}\rangle$
b. IN-NPQ: $\langle\{-^{ev}\},\{+^{ep}\}\rangle$
c. ON-NPQ: $\langle\{-^{ev},\%^{ev}\},\{+^{ep}\}\rangle$

[2] Japanese ∅-Interrogative (Sudo 2013:285)

a. PPQ: $\langle\{\%^{ev}\},\{+^{ep},-^{ep},\%^{ep}\}\rangle$
b. IN-NPQ: $\langle\{-^{ev}\},\{+^{ep},-^{ep},\%^{ep}\}\rangle$
c. ON-NPQ: $\langle\{+^{ev},\%^{ev}\},\{+^{ep}\}\rangle$

[3] Japanese *no*-Interrogative (Sudo 2013:288) [=(4)]

a. PPQ: $\langle\{+^{ev}\},\{+^{ep},-^{ep},\%^{ep}\}\rangle$
b. IN-NPQ: $\langle\{-^{ev}\},\{+^{ep}\}\rangle$
c. ON-NPQ: $\langle\{+^{ev},-^{ev},\%^{ev}\},\{+^{ep}\}\rangle$

[4] Japanese *desho*-Interrogative (Sudo 2013:290) [=(23)]

a. PPQ: $\langle\{+^{ev},-^{ev},\%^{ev}\},\{+^{ep}\}\rangle$
b. IN-NPQ: $\langle\{+^{ev},-^{ev},\%^{ev}\},\{-^{ep}\}\rangle$
c. ON-NPQ: $\langle\{-^{ev},\%^{ev}\},\{-^{ep}\}\rangle$

[5] Hungarian /\-Interrogative (Gyuris 2017: Section 4)

a. PPQ: $\langle\{+^{ev},\%^{ev}\},\{+^{ep},-^{ep},\%^{ep}\}\rangle$
b. IN-NPQ: $\langle\{-^{ev}\},\{+^{ep}\}\rangle$
c. ON-NPQ: $\langle\{-^{ev},\%^{ev}\},\{+^{ep}\}\rangle$

[6] Hungarian *e*-Interrogative (Gyuris 2017: Section 4) [=(10)]

a. PPQ: $\langle\{\%^{ev}\},\{+^{ep},-^{ep},\%^{ep}\}\rangle$
b. ~~IN-NPQ:~~
c. ON-NPQ: $\langle\{\%^{ev}\},\{+^{ep}\}\rangle$

Appendix B: Calculating the "Effectiveness" of *Quantitive Markedness*

"Distributive" [=(11a)]:

[1] $|\underline{PPQ}^{ev}| \geq |\underline{IN\text{-}NPQ}^{ev}|/|\underline{ON\text{-}NPQ}^{ev}|$ &
$|\underline{PPQ}^{ep}| \geq |\underline{IN\text{-}NPQ}^{ep}|/|\underline{ON\text{-}NPQ}^{ep}|$

3 cases: $|\underline{PPQ}^{ev/ep}| = 1$ >> 3 choices for NPQs
3 cases: $|\underline{PPQ}^{ev/ep}| = 2$ >> 6 choices for NPQs
1 case: $|\underline{PPQ}^{ev/ep}| = 3$ >> 7 choices for NPQs

$[(3\times3\times3)+(3\times6\times6)+(1\times7\times7)]^2 = 33856$

"Collective" [=(11b)]:

[2] $|\underline{PPQ}^{ev}|+|\underline{PPQ}^{ep}| \geq |\underline{IN\text{-}NPQ}^{ev}|+|\underline{IN\text{-}NPQ}^{ep}|$ &
$|\underline{PPQ}^{ev}|+|\underline{PPQ}^{ep}| \geq |\underline{ON\text{-}NPQ}^{ev}|+|\underline{ON\text{-}NPQ}^{ep}|$

9 cases: $|PPQ^{ev}|+|PPQ^{ep}| = 2$ >> 9 choices for NPQs
18 cases: $|PPQ^{ev}|+|PPQ^{ep}| = 3$ >> 9+18 choices for NPQs
15 cases: $|PPQ^{ev}|+|PPQ^{ep}| = 4$ >> 9+18+15 choices for NPQs
6 cases: $|PPQ^{ev}|+|PPQ^{ep}| = 5$ >> 9+18+15+6 choices for NPQs
1 case: $|PPQ^{ev}|+|PPQ^{ep}| = 6$ >> 9+18+15+6+1 choices for NPQs

$[9 \times 9^2] + [18 \times (9 + 18)^2] + [15 \times (9 + 18 + 15)^2] +$
$[6 \times (9 + 18 + 15 + 6)^2] + [1 \times (9 + 18 + 15 + 6 + 1)^2] = 56536$

References

AnderBois, Scott. 2011. "Issues and Alternatives." Ph.D. Dissertation, UC Santa Cruz.

Asano-Cavanagh, Yuko. 2011. "An Analysis of Three Japanese Tags. *ne*, *yone*, and *daroo*." *Pragmatics & Cognition* 19:448-75.

Beaver, David. 2004. "The Optimization of Discourse Anaphora." *Linguistics and Philosophy* 27:3-56.

Beaver, David, and Hanjung Lee. 2004. "Input-Output Mismatches in OT." Pp. 112-53 in *Optimality Theory and Pragmatics*, edited by Reinhard Blutner and Henk Zeevat. Houndmills: Palgrave Macmillan.

Blutner, Reinhard, and Henk Zeevat. 2004a. "Editors' Introduction: Pragmatics in Optimality Theory." Pp. 1-23 in *Optimality Theory and Pragmatics*, edited by Reinhard Blutner and Henk Zeevat. Basingstoke: Palgrave Macmillan.

— (Eds.). 2004b. *Optimality Theory and Pragmatics*. Houndmills: Palgrave Macmillan.

Bolinger, Dwight. 1957. *Interrogative Structures of American English (The Direct Question)*. Tuscaloosa, AL: The University of Alabama Press.

Büring, Daniel, and Christine Gunlogson. 2000. "Aren't Positive and Negative Polar Questions the Same?". Unpublished manuscript, UCLA & UCSC.

Davis, Christopher. 2011. "Constraining Interpretation: Sentence Final Particles in Japanese." Ph.D. Dissertation, University of Massachusetts at Amherst.

Dryer, Matthew. 2005a. "Polar Questions." Pp. chapter 116 in *The World Atlas of Language Structures*, edited by Martin Haspelmath, Matthew Dryer, David Gil, and Bernard Comrie. Oxford: OUP.

—. 2005b. "Position of Polar Question Particles." Pp. chapter 92 in *The World Atlas of Language Structures*, edited by Martin Haspelmath, Matthew Dryer, David Gil, and Bernard Comrie. Oxford: OUP.

Farkas, Donka, and Kim Bruce. 2010. "On Reacting to Assertions and Polar Questions." *Journal of Semantics* 27:81-118.

Farkas, Donka, and Floris Roelofsen. 2017. "Division of Labor in the Interpretation of Declaratives and Interrogatives." *Journal of Semantics* 34:237-89.

Gärdenfors, Peter. 2014. *The Geometry of Meaning. Semantics Based on Conceptual Spaces*. Cambridge, MA: MIT Press.

Gärtner, Hans-Martin, and Beáta Gyuris. 2012. "Pragmatic Markers in Hungarian: Some Introductory Remarks." *Acta Linguistica Hungarica* 59:387-426.

Gunlogson, Christine. 2003. *True to Form. Rising and Falling Declaratives as Questions in English*. New York: Routledge.

Gyuris, Beáta. 2017. "New Perspectives on Bias in Polar Questions: A Study of Hungarian *-e*." *International Review of Pragmatics* 9:1-50.

Hagstrom, Paul. 2006. "A-not-A Questions." Pp. 173-213 in *The Blackwell Companion to Syntax, I*, edited by Martin Everaert and Henk van Riemsdijk. Oxford: Blackwell.

Hendriks, Petra, and Helen de Hoop. 2001. "Optimality Theoretic Semantics." *Linguistics and Philosophy* 24:1-32.

Horn, Laurence. 1984. "Toward a New Taxonomy for Pragmatic Inference: Q-Based and R-Based Implicature." Pp. 11-42 in *Meaning, Form and Use in Context*, edited by Deborah Schiffrin. Washington, DC: Georgetown University Press.

Huddleston, Rodney. 2002. "Clause Type and Illocutionary Force." Pp. 851-945 in *The Cambridge Grammar of the English Language*, edited by Rodney Huddleston and Geoffrey Pullum. Cambridge: CUP.

Hudson, Richard. 1975. "The Meaning of Questions." *Language* 51:1-31.

Ito, Satoshi, and David Oshima. 2016. "On Two Varieties of Negative Polar Interrogatives in Japanese." Pp. 229-43 in *Japanese/Korean Linguistics, Vol. 23*, edited by Michael Kenstowicz, Theodore Levin, and Ryo Masuda. Stanford, CA: CSLI Publications.

Krifka, Manfred. 2015. "Bias in Commitment Space Semantics: Declarative Questions, Negated Questions, and Question Tags." *SALT* 25:328-45.

—. 2017. "Negated Polarity Questions as Denegations of Assertions." Pp. 359-98 in *Contrastiveness in Information Structure, Alternatives and Scalar Implicatures*, edited by Chungmin Lee, Ferenc Kiefer, and Manfred Krifka. Heidelberg: Springer.

Ladd, D. Robert. 1981. "A First Look at the Semantics and Pragmatics of Negative Questions and Tag Questions." *CLS* 17:164-71.

Lyons, John. 1977. *Semantics*. Oxford: O.U.P.

Matthewson, Lisa. 2011. "Methods in Cross-Linguistic Semantics." Pp. 268-85 in *Semantics*, edited by Claudia Maienborn, Klaus von Heusinger, and Paul Portner. Berlin: de Gruyter.

Reese, Brian. 2007. "Bias in Questions." Ph.D. Dissertation. University of Texas at Austin.

Roelofsen, Floris, and Donka Farkas. 2015. "Polarity Particle Responses as a Window onto the Interpretation of Questions and Assertions." *Language* 91:359-414.

Roelofsen, Floris, Noortje Venhuizen, and Galit Weidman Sassoon. 2012. "Positive and Negative Questions in Discourse." *Sinn und Bedeutung* 17:455-72.

Romero, Maribel, and Chung-hye Han. 2004. "On Negative *Yes/No* Questions." *Linguistics and Philosophy* 27:609-58.
Seuren, Pieter. 1969. *Operators and Nucleus*. Cambridge: CUP.
Siemund, Peter. 2001. "Interrogative Constructions." Pp. 1010-28 in *Sprachtypologie und sprachliche Universalien. Ein Internationales Handbuch*, edited by Martin Haspelmath, Ekkehard König, Wulf Oesterreicher, and Wolfgang Raible. Berlin: de Gruyter.
Sudo, Yasutada. 2013. "Biased Polar Questions in English and Japanese." Pp. 277-97 in *Beyond Expressives: Explorations in Use-Conditional Meaning*, edited by Daniel Gutzmann and Hans-Martin Gärtner. Leiden: Brill.
Trinh, Tue. 2014. "How to Ask the Obvious. A Presuppositional Account of Evidential Bias in English Yes/No Questions." *MIT Working Papers in Linguistics* 71:227-49.
Truckenbrodt, Hubert. 2006. "On the Semantic Motivation of Syntactic Verb Movement to C in German." *Theoretical Linguistics* 32:257-306.
Ultan, Russell. 1978. "Some General Characteristics of Interrogative Systems." Pp. 211-48 in *Universals of Human Language. Vol. 4: Syntax*, edited by Joseph Greenberg. Stanford, CA: Stanford University Press.
van Rooy, Robert. 2003. "Questioning to Resolve Decision Problems." *Linguistics and Philosophy* 26:727-63.
van Rooy, Robert, and Marie Šafářová. 2003. "On Polar Questions." *SALT* 13:292-309.
Zimmermann, Malte. 2011. "Discourse Particles." Pp. 2011-38 in *Semantics*, edited by Klaus von Heusinger, Claudia Maienborn, and Paul Portner. Berlin: de Gruyter.
—. 2013. "*Ob*-VL-Interrogativsatz." Pp. 84-104 in *Satztypen des Deutschen*, edited by Jörg Meibauer, Markus Steinbach, and Hans Altmann. Berlin: de Gruyter.