Negation in Czech polar questions

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1 Introduction

In this article, I focus on Czech polar questions, specifically those that contain a negative verb. I am especially interested in the interplay of formal and semantic/pragmatic features of polar questions. The overarching research question of this study is: How do formal properties of Czech polar questions interact with their semantic and pragmatic properties?

Particularly, I zoom in on the questions' word order, the type of negation they employ and also in which context they appear. I tested these empirically in a naturalness rating task.

In section 2, I provide a short overview of previous claims about polar questions and their form (their word order and polarity), which is connected to the questions' meaning and bias. I present my experiments in section 3. Section 4 concludes the article.

2 Background

The topic of polar questions (henceforth PQs) has received a substantial amount of attention lately.[1] They have been studied experimentally (e.g. Tian et al. 2021) as well as theoretically (e.g. Ladd 1981, Romero & Han 2004) across languages.

Formally, Czech PQs are characterized by a rise or fall-rise intonation pattern (Palková 1994), and they are interesting with respect to their word order, which I describe next.

2.1 Word order

In English, the primary and unmarked way of forming a PQ is by preposing the finite verb (auxiliary) to the first position in the sentence (= V1). The subject-verb inversion in English is shown in example (1) on an S-V and an Aux-S sentence. Note that "declarative" and "interrogative" are terms used to describe form (not meaning).

(1) a. Peter has bought a car. — declarative
SBJ AUX V DET OBJ

b. **Has** Peter bought a car? — interrogative
AUX SBJ V DET OBJ

[1] Some authors use the term "*yes/no* questions" which refers to the possible answer words. In Czech, they are usually called "zjišťovací otázky" (Grepl 1965).

In Czech, V1 questions are considered as neutral and unmarked in meaning (Křížková 1968, Štícha 1995). Some authors suggest that word order is not a constitutive formal means of Czech PQs, at least not as indicative as intonation (Daneš et al. 1987, Grepl & Karlík 1998, Malá 2008, Dušková et al. 2012). This is because in Czech, pronominal subjects are in most instances covert, and therefore questions and assertions can be formed by the same (declarative) word order. Just like in English, there are PQs with a declarative form in Czech (declarative PQs, for short). Declarative PQs are associated with additional inferences called biases (Štícha 1995, Gunlogson 2002, Jeong 2018, Rudin 2022).

In Czech PQs, the finite verb is in the indicative or conditional mood, and since Czech has a relatively free word order, it can be spelled-out in different positions (Veselovská 1995). What is characteristic of PQs with an overt non-pronominal subject is that the finite verb moves in front of it to the initial position. This is exemplified in (2-a) and (2-b), where the verb (past participle) moves past the subject *Standa* and the clitic *si*.[2] When the subject is overt and preceded by a finite verb, the sentence has to be interpreted as a question (Štícha 1995).

(2) a. Přečetl si Standa ten dopis?
read.PTCP REFL Standa DET letter
'Has Standa read the letter?'

b. Nepřečetl si Standa ten dopis?
NEG-read.PTCP REFL Standa DET letter
'Hasn't Standa read the letter?'

This type of verb movement has been extensively discussed (Rivero 1991, Migdalski 2006, Harizanov 2019). For my purposes, I suggest that the verb/participle moves as a head to the polarity phrase PolP above CP. This is related to the topic of polarity in PQs, which I address next.

2.2 Polarity

The difference between positive and negative PQs has drawn much scientific attention, as well as the differences between negative PQs (their syntax and semantics) themselves (e.g. Ladd 1981, Büring & Gunlogson 2000, Romero & Han 2004).

In English PQs, the syntactic position of negation can be either low (3-a) or high (3-b). The English negative marker is a head on its own, unlike in Czech, where it is fixed on a verb in the form of a prefix.

(3) a. Is John not cooking a Mexican dish? low negation
b. Isn't John cooking a Mexican dish? high negation

Moreover, there are two types of negation reading: inner and outer. Inner negation (= semantic, propositional) triggers the semantic operator ¬ and is interpreted. Since Czech is a strict negative concord language, indefinites like *žádný* 'no.DET', *nikdo* 'nobody', *nic* 'nothing' etc. have to be accompanied by a negative marker: the *ne* prefix on the verb. The prefix needs to be governed by the abstract negative operator ¬. Indefinites like *žádný* are called negative concord items (= NCIs), and they are taken to be indicators of inner negation (Penka 2011). Outer negation (= pleonastic, expletive) is not interpreted on the

[2]In the English translations, which are part of the examples, I use the syntactic form which was proposed for the respective bias profiles by e.g. Büring & Gunlogson 2000, Sudo 2013.

truth-conditional level. It licenses positive polarity items (= PPIs), such as indefinites like *nějaký* 'some.DET' or *něco* 'something'.

Romero & Han (2004) argue that low negation in English has to be interpreted as inner, whereas high negation is ambiguous between inner and outer.[3] More recent research noticed that even the high syntactic position of negation in PQs is associated with a certain interpretation (AnderBois 2019, Goodhue 2022). Low negation correlates with inner, whereas high negation correlates with outer. I test these assumptions in my experiments on Czech.

In the following section, I briefly comment on the semantics of PQs and I introduce the topic of biased PQs, because inner vs. outer negation PQs are said to convey different meaning shades (biases).

2.3 Bias

From a semantic point view, the meaning of a PQ can be defined in terms of its (possible) answers (Hamblin 1973, Karttunen 1977, Groenendijk & Stokhof 1984). These are captured as two propositions, p and $\neg p$, by the means of a partition. The meaning of a PQ in (4-a) is rewritten in (4-b).

(4) a. Prší?
rain.PRS
'Is it raining?'

b. {prší, neprší} = $\{p, \neg p\}$
{'it is raining', 'it is not raining'}

Apart from the semantic meaning, PQs are able to carry quite complex pragmatic meanings. These can be subsumed under the term BIAS. Previous literature typically distinguishes two types of bias: epistemic and evidential (Sudo 2013, Gärtner & Gyuris 2017). Epistemic bias is characterized as the private beliefs, desires or hopes of the speaker of the PQ. For example, if the speaker believes that the answer to their question will be 'yes', then we say that the PQ carries positive epistemic bias. On the other hand, evidential bias stems from public evidence which is shared by the interlocutors and which makes the speaker expect a certain answer. In my experiments, contextual evidence (= source of evidential bias) was one of the manipulated variables.

For English, it has been claimed that inner negation PQs require negative evidential and positive epistemic bias. The clash between the biases prompts the speaker to pose the PQ. English outer negation PQs are claimed to require negative or neutral evidential and positive epistemic bias (Sudo 2013, Gärtner & Gyuris 2017).[4]

The aim of my work is to map the bias profile of negative PQs in Czech. I introduce the experiments in the next section.

3 Experiments

I designed a naturalness judgment task to investigate Czech PQs and their properties. Both the main experiment and the filler experiment consisted of negative PQs.[5] They

[3] Thus, the terms low and high are related to syntax, but inner and outer are terms describing meaning.

[4] Neutral bias means that the PQ is not biased to p, nor $\neg p$.

[5] There were additional filler experiments included, but I do not comment on them here. They tested the behavior of question particles, such as *copak* or *náhodou*.

condition	CONTEXT	VERB POSITION	INDEFINITE
a	neg-biased	V1	NCI
b	neutral	V1	NCI
c	neg-biased	V1	PPI
d	neutral	V1	PPI
e	neg-biased	non-V1	NCI
f	neutral	non-V1	NCI
g	neg-biased	non-V1	PPI
h	neutral	non-V1	PPI

Table 1: Variable manipulations for individual conditions (E1)

were combined into one experimental set-up, so that I could compare the results of the same participant group.[6]

In the following, I describe the participants and method in more detail for both the main and filler experiment. I continue with the design, materials and predictions for each of the experiments separately. Finally, I present the results and discuss them.

3.1 Participants & method

In total, 139 participants took part in the task. 10 of them were excluded from the data set because they did not pass the criteria set for reliable participants. The final descriptive and inferential statistical analyses work with data from 75 participants. All the participants were native speakers of Czech, mostly students from the Charles University.

The participants were presented with written mini-conversations between two people labeled A and B. The conversations consisted of two utterances: the first one (uttered by A) was the contextual information and the other (uttered by B) was a PQ. Audio was not available, so the participants had to imagine the rise or fall-rise intonation pattern of a PQ on their own.

The participants' task was to rate the naturalness of the PQ on a Likert scale ranging from 1 (= least natural) to 7 (= completely natural). Before the actual task, the participants read instructions how to rate and saw 2 example stimuli with the preferred way of rating. The items were distributed over lists by Latin Square. The experiments were run online on L-Rex (Starschenko & Wierzba 2022).

3.2 Main experiment

3.2.1 Design & materials

The design of the main experiment (= E1) was a within-item and within-participant $2 \times 2 \times 2$, as I manipulated 3 variables (CONTEXT, VERB POSITION and INDEFINITE), each with 2 possible values. It consisted of 32 items. Table 1 schematically summarizes all the 8 conditions. In (5), I provide an example item for illustration.

CONTEXT was either neutral (not biased, not implying p, nor $\neg p$; uttered by A in (5)), or negatively biased (biased for $\neg p$; uttered by A' in (5)). It was important that the new

[6]The experiments were preregistered on OSF. There are also all the experimental items and results.

information in the relative clause did not entail p nor $\neg p$, so that it still allowed for the question to be asked. The gender of characters in the items was balanced, so there were female as well as male protagonists.

As for VERB POSITION, it was either initial (= V1; uttered by B in (5)), or non-initial (= non-V1; uttered by B' in (5)). V1 PQs represented the intterogative word order, whereas non-V1 ones reprepresented declarative word order.

The values of the third variable INDEFINITE were either NCI (= *žádný*) and PPI (= *nějaký*). They were realized as determiners of the object phrase. The indefinites were used as a proxy for outer (PPI) and inner (NCI) negation.

(5) A: Jana má na zahradě záhon, **který vybudovala před rokem**. neutral
Jana has in garden garden.bed, which built before year
'Jana has a garden bed, which she built a year ago.'

A′: Jana má na zahradě záhon, **kam zasadila zeleninu**. neg-biased
Jana has in garden garden.bed, where planted vegetables
'Jana has a garden bed, where she planted vegetables.'

B: **Nezasadila** tam Jana {**žádné** / **nějaké**} květiny? V1
NEG.planted there Jana DET.NCI DET.PPI flowers

B′: Jana tam **nezasadila** {**žádné** / **nějaké**} květiny? non-V1
Jana there NEG.planted DET.NCI DET.PPI flowers
'Didn't Jana / Did not Jana / Jana didn't plant there any / some flowers?'

3.2.2 Predictions

From the syntactic point of view, negative PQs with an interrogative word order (V1) were expected to trigger the outer negation reading signalled by a PPI. NCIs should be unnatural in these PQs.

In negative PQs with a declarative word order (non-V1), the negative verb stays lower in the structure and is thus able to license outer as well as inner negation (unlike in English). The inner negation reading is the most canonical for the non-V1 word order, so NCIs were expected to be preferable to PPIs.

More predictions stemmed from the questions' contexts. It was predicted that V1 negative PQs do not require evidential bias (in the preceding context there does not have to be contextual evidence for them to be perceived as natural), because they exhibit the neutral interrogative word order, which carries no bias. They can, however, likewise appear in negatively biased contexts implying $\neg p$.

Negative non-V1 PQs, on the other hand, were expected to require negative evidential bias – there should be negative contextual evidence preceding the question. In neutral contexts, they would be unnatural.

The predicted relations between the individual variables could be summarized as follows:

- VERB POSITION interacts with INDEFINITE
- CONTEXT has influence on INDEFINITE
- CONTEXT has influence on VERB POSITION

As for the interplay of the syntactic and semantic/pragmatic properties of negative PQs, I present them in Table 2. It shows the predictions for the individual conditions

cond.	V POS – INDEF	CTXT – INDEF	CTXT – V POS	expected rating
a	+	−	−	medial
b	+	+	−	low
c	−	−	−	high
d	−	−	−	high
e	−	−	−	high
f	−	+	+	low
g	+	−	−	medial
h	+	−	+	low

Table 2: Predictions for individual conditions (E1)

according to three types of clashes. Either there is a clash in the inner syntactic make-up, meaning that VERB POSITION and INDEFINITE are incompatible; or there is a clash between CONTEXT and INDEFINITE, or CONTEXT and VERB POSITION. A "+" means there is a clash, a "−" means there is not any. Based on these evaluations, I computed the overall expected ratings of the individual conditions.

3.2.3 Results & discussion

Figure 1 shows the results of the main experiment. On the y-axis, there is the proportion of ratings, which is represented by the shades in the stacked bar plot. On the x-axis, there are the two CONTEXTS: negative (neg-biased) and neutral. The horizontal line cuts through the median rating in each cell. Figure 2 plots the median values again in order to make the effects/interactions of the variables more visible.

The results of the main experiment exhibited some strong tendencies which Czech negative PQs follow. I used the `ordinal` package in R to fit a random slopes Cummulative Link Mixed Model (Christensen 2022). I divided the data set to V1 and non-V1 PQs.

In V1 PQs, there was an apparent main effect of INDEFINITE: PPIs were more natural than NCIs ($p < 0.001$). This tells us that negative V1 PQs are mostly interpreted as outer negation, which agrees with the expectations – the expected ratings of conditions (c) and (d) (V1 + PPI) in Table 2 were "high", also because of no clash in their structural make-up.

CONTEXT did not show any statistically significant effect in V1 PQs (see Figure 2). These PQs do not have any requirements with respect to their context. This agrees with previous claims about V1 PQs being a neutral means of asking for information (carrying neutral evidential bias), but also with the idea that they express negative evidential bias.

In V1 PQs, there was, however, a slight interaction between INDEFINITE and CONTEXT ($p < 0.01$): negatively biased context was more natural with NCIs, and neutral context was more natural with PPIs. It seems that even though V1 PQs with an NCI were largely unnatural, the negatively biased context helped to increase their rating. V1 PQs with a PPI were completely natural, though their rating slightly improved in neutral context. This is probably connected to the fact that inner negation PQs need negative contextual evidence, whereas outer negation PQs do not necessarily require it.

Just like in V1 PQs, for non-V1 PQs I observed main effect of INDEFINITE: this time, NCIs were more natural than PPIs ($p < 0.001$). This was expected, although PPIs

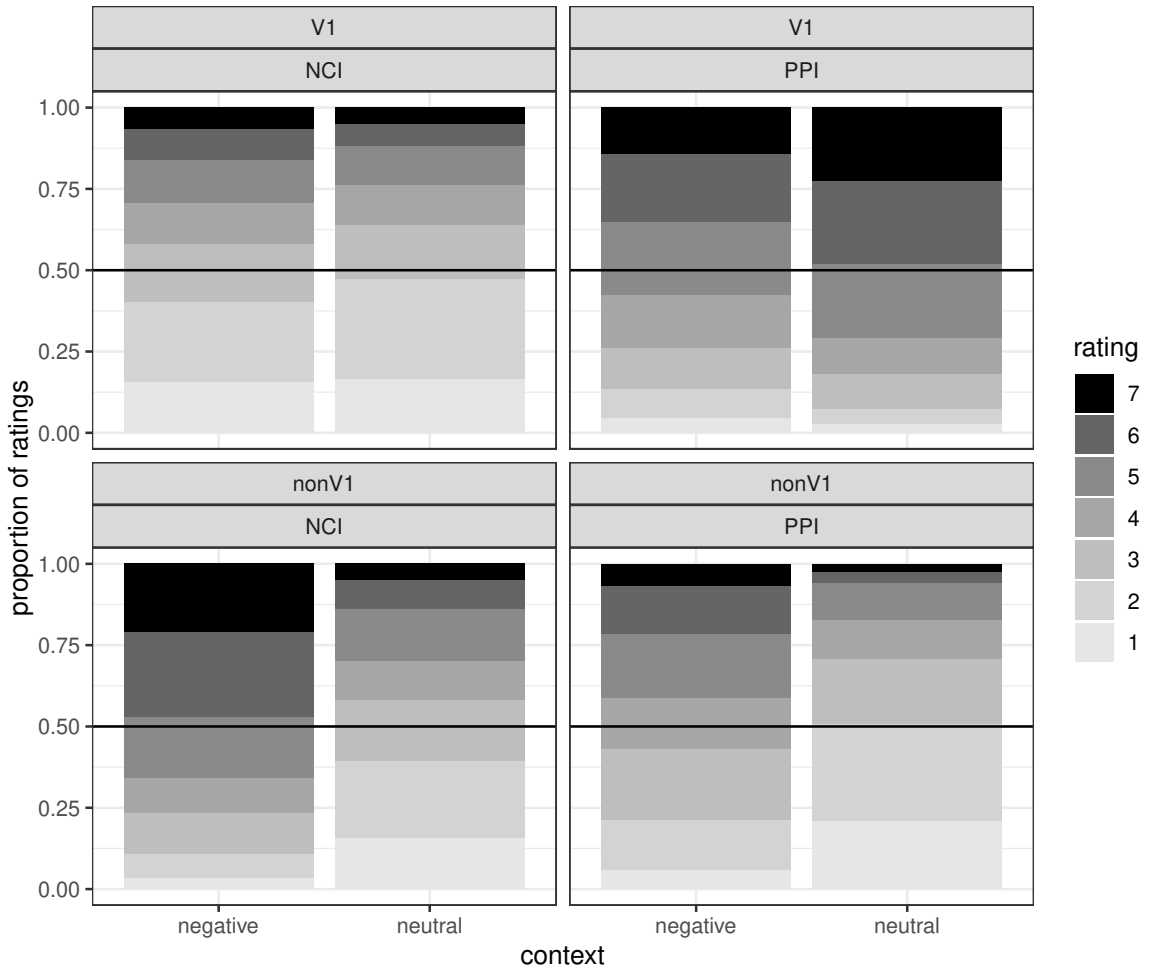

Figure 1: Overall results (E1)

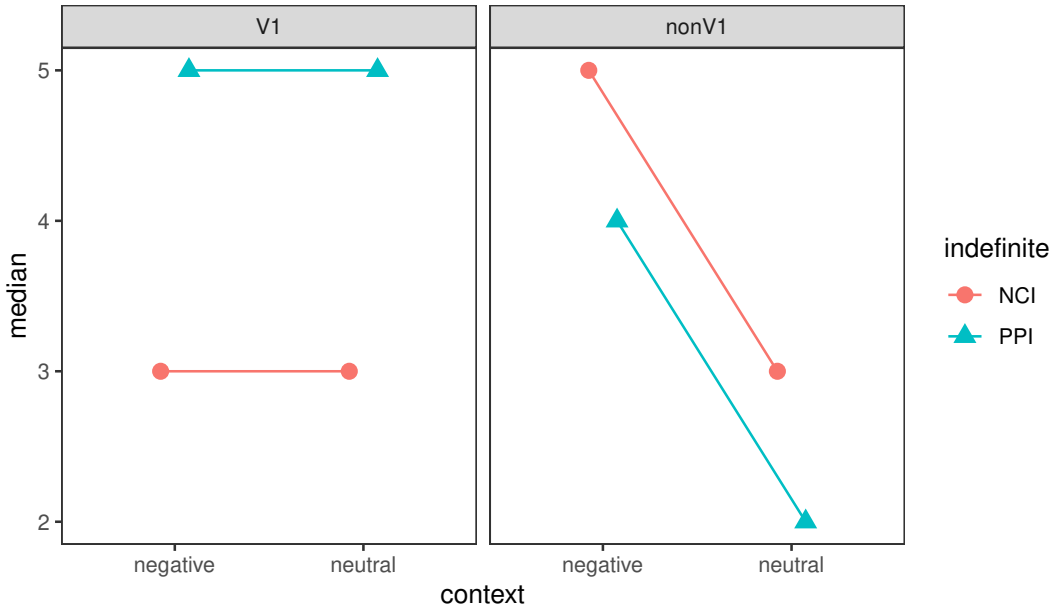

Figure 2: Correlations (E1)

condition	CONTEXT	POLARITY
a	pos-biased	negative
b	neutral	negative
c	pos-biased	positive
d	neutral	positive

Table 3: Variable manipulations for individual conditions (F1)

were also natural whenever CONTEXT was negative (median = 4). This was connected to the main effect of CONTEXT in non-V1 PQs, where negative was more natural than neutral ($p < 0.01$). These results support the claims about non-V1 PQs which require some contextual evidence to be felicitous. There was, again, a slight interaction between INDEFINITE and CONTEXT ($p < 0.01$).

Overall, the experiment showed that the outer negation interpretation is possible for V1 as well as non-V1 PQs, although in these cases, negatively biased context is required. The inner negation interpretation occurred mainly in non-V1. This observation was supported by the statistical model run for the whole data set, where INDEFINITE interacted with VERB POSITION ($p < 0.001$).

V1 PQs did not differ all that much with respect to the context in which they appeared. On the contrary, the rating of non-V1 PQs in negatively biased context got significantly higher. This confirmed the expected interaction between CONTEXT and VERB POSITION ($p < 0.001$).

Next, I describe the filler experiment aimed at further examination of outer negation PQs.

3.3 Filler experiment

The filler experiment (F1) contained positive and outer negation PQs. Its design was 2×2 and it consisted of 8 items. Table 3 summarizes the design and an example item is provided in (6). I manipulated CONTEXT: either it was positively biased (implying p), or neutral; and POLARITY: either the PQ was negative, or positive. Because of this, the indefinite used was *nějaký* and the verb stood at the initial position in all the conditions.

(6) A: Viktor se pohádal s manželkou, **které byl nevěrný**. pos-biased
Viktor REFL argued with wife, on.whom was unfaithful.
'Viktor argued with his wife, on whom he cheated.'

A′: Viktor se pohádal s manželkou, **se kterou má tři děti**. neutral
Viktor REFL argued with wife, with whom has three children.
'Viktor argued with his wife, with whom he has three children.'

B: {**Nenašel** / **Našel**} si Viktor nějakou milenku? polarity
NEG.found found REFL Viktor DET.PPI lover?
'Did / Didn't Viktor find himself a lover?'

3.3.1 Predictions

Positive PQs with an initial verb were expected to be natural after neutral context. In this case, the speaker of the PQ is asking about the protagonist mentioned in the context

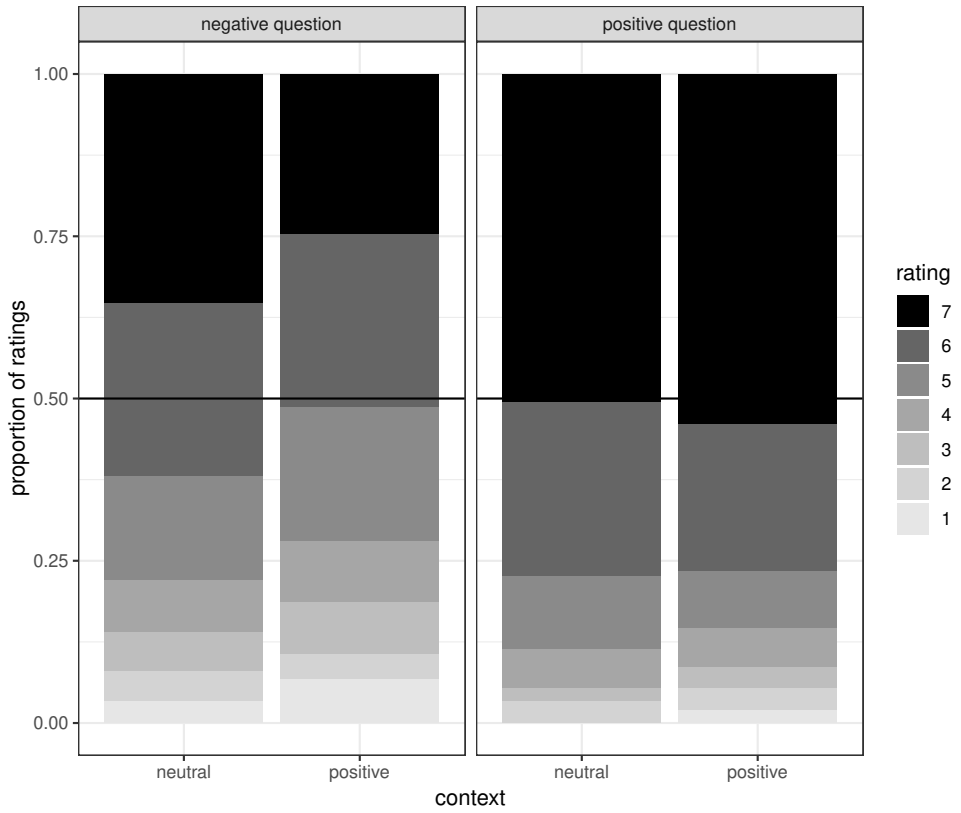

Figure 3: Overall results (F1)

and the main function of the PQ is to simply fill their information gap, not to ascertain previous beliefs or expectations, nor doubt what the addressee is saying. Positive PQs were expected to be less natural after the positively biased context. Its form does not signal any bias, which could lower its naturalness in a biased context.

PQs with outer negation were expected to be natural after neutral context (just like in E1), but unnatural after the positively biased one (Sudo 2013).

3.4 Results & discussion

The results of F1 are shown in Figure 3. Unlike in E1, the values of CONTEXT on the x-axis are neutral and positive (pos-biased). 'Negative question' refers to an outer negation PQ.

The results of the filler experiment showed that positive PQs were, in general, considered more natural than outer negation ones ($p < 0.001$). Positive PQs are claimed to be a neutral way of asking a question and they are more frequent in general. This frequency effect probably led to the different rating of positive and outer negation PQs.

Interestingly, there was no statistically significant CONTEXT effect ($p = 0.225$). This could be interpreted as a similarity of outer negation and positive PQs, although we see that they are not completely interchangeable. This was evident already from the main experiment, where outer negation PQs appeared in negatively biased context, which is impossible for positive PQs.

Positive PQs were expected to be less natural in biased context, since they were V1, which is claimed to be the most unmarked form of a question, not signalling any bias. This was not observed in my data set, as positive PQs received considerably high ratings

in both contexts.

Outer negation PQs were expected to be natural in neutral contexts (just like in E1), which proved correct, but they were rated similarly natural in positively biased context. This shows us that Czech outer negation PQs have a wider range of possible evidential bias values than the English ones: they can appear in all three types of context.
With this, I end the section about the experiments. In the next one, I make concluding remarks.

4 Conclusion

In my study, I looked at the topic of Czech polar questions from the formal perspective. I investigated the interplay of their formal features, such as word order or negation, and their semantic and pragmatic interpretation, esp. bias.

The experiments offered an empirical point of view of the topic of PQs. They provided data which helped me map the usage of PQs in Czech. In contrast to corpus data, I could manipulate certain variables, such as the PQ's word order (V1 vs. non-V1), type of negation (inner vs. outer) or context (biased vs. neutral).

The results showed that negative PQs with an initial verb tended towards the outer negation interpretation, whereas those with a non-initial verb tended towards the inner negation interpretation. However, outer negation can also appear in declarative PQs, once there is a negative contextual evidence present. Since Czech is a Slavic language, it seems natural to expect that it behaves differently from other families of languages. This assumption proved to be right, because Czech outer negation PQs are licensed even in positively biased context.

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