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# The elastic nonveridicality property of indicative conditionals

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**Abstract:** Indicative conditionals are known to have the semantic property of nonveridicality, that is, they do not entail the truth of the antecedent. In this paper, I argue that the nonveridicality property of indicative conditionals is elastic in that it can be affected by the choice of conditional connectives and negative polarity items. Two experiments are reported, one on German and the other on English. They show that in both languages, the presence of negative polarity items conveys a weakened speaker commitment towards the antecedent, although there is cross-linguistic variation concerning the effect of conditional connectives.

**Keywords:** indicative conditionals; nonveridicality; speaker commitment; conditional connective; negative polarity item.

## 1 Introduction

From a sentence such as *If it is raining outside, Sue will stay home*, we cannot infer that (the speaker believes) it is raining outside, in contrast to one such as *Because it is raining outside, Sue will stay home*. The difference between the conditional vs. causal connective that is intuitive to naïve language users can be captured by the theoretical notion of (non)veridicality, as defined in (1).

(1) Epistemic model of an individual (Giannakidou 1999: 45): A model $M_E(x) \in M$ is a set of worlds associated with an individual $x$ representing worlds compatible with what $x$ believes and knows.
   a. A propositional operator $F$ is veridical iff $Fp$ entails or presupposes that $p$ is true in some individual's model $M_E(x)$; $p$ is true in $M_E(x)$, if $M_E(x) \subset p$, i.e. if all worlds in $M_E(x)$ are $p$-worlds.
   b. If (a) is not the case, $F$ is nonveridical.
   c. $F$ is antiveridical iff $Fp$ entails $\neg p$ in some individual's model: iff $M_E(x) \cap p = \emptyset$.

By these definitions, *because* is a veridical operator with regard to its first argument $p$ (i.e. the cause content), as it entails or presupposes that $p$ is true in the speaker's belief model. In contrast, *if* is a nonveridical propositional operator with regard to its first argument (i.e. the content in the antecedent, henceforth, just the antecedent to simplify). Based on Giannakidou (1998, 1999), Giannakidou (2014) relates the notion of (non)veridicality to one of (epistemic) commitment (i.e. credence), veridicality to "full commitment of an individual", anti-veridicality to "counter-commitment" and nonveridicality to "weakened commitment". Furthermore, in a more recent attempt to interpret tense and mood, Giannakidou and Mari (2017) propose the scale of commitment strength for overt and covert modal operators in (2). Even though logically speaking, *MUST(p)* entails $p$, the addition of the modal verb to a natural language sentence conveys a lower degree of speaker commitment.

(2) Commitment strength:
   More committed $<$ *unmodalized p*, *MUST p*, *POSSIBLY p*$>$ Less committed
   a. *It is raining.* (unmodalized $p$)
   b. *It must be raining.* (*MUST p*)
   c. *It is possibly raining.* (*POSSIBLY p*)

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Following these, the contrast between *because* and *if* can be modeled along a commitment scale as in (3).

(3) More committed < *BECAUSE p*, *IF p*> Less committed

The nonveridicality property of indicative conditionals can explain the following empirical observations, among others: (1) Unlike causals, conditionals license negative polarity items (NPIs) in the antecedent, as NPIs need licensing by nonveridical contexts (Giannakidou 1998 and subsequent works). (2) Conditionals are incompatible with veridical expressions such as factive evaluative adverbs, unlike causals (cf. Asher 2000; Liu 2012). On the other hand, it is known that the properties of conditionals are subject to a process of semantic and pragmatic modulations – in terms of nonveridicality, subjunctive conditionals can be "antiveridical" as illustrated in the English example of (4a), or veridical as illustrated in the Mandarin example of (4b), with the lexicalized counterfactual conditional connective *yaobushi* "if-not" (cf. Jiang 2000, Jiang 2014, Jiang 2019; Hsu 2014).

(4) a. *If it had rained outside, Sue would have stayed home.*

b. *Yaobushi xiayu, Sue buhui dai zai jiali.*
*If-not rain, Sue NEG-will stay at home*
'If it hadn't rained, Sue wouldn't have stayed home.'

In this paper, I will provide cross-linguistic experimental evidence that the nonveridicality of conditionals is elastic, namely, the degree of speaker commitment towards the antecedent can differ depending on the choice of words. As a first step, I will focus on indicative conditionals and two kinds of expressions, namely, conditional connectives (CCs) and NPIs. The paper is structured as follows: in Section 2, I will motivate and elaborate on speaker commitment scales with conditionals. In Section 3, I will report on two rating studies testing speaker commitment scales with conditionals. While both studies show that NPIs have a significant effect on lowering speaker commitment, there is intra- and cross-linguistic variation concerning the role of CCs. In Section 4, I will conclude the paper by discussing the results and implications of the studies.

## 2 Speaker commitment scales with conditionals

It is a long but ongoing debate concerning the question of how to compositionally derive the different meanings that conditionals in natural language convey and what meaning contribution a CC such as English *if* makes (cf. von Fintel 2007, von Fintel 2011, von Fintel 2012). In the formal semantic literature, the most influential theory of conditionals has been the restrictor analysis proposed by Kratzer (1986, 1991), who argues for not treating natural language CCs as a sentential connective but as a restrictor. In this approach, the English CC *if* does not have a distinctive conditional meaning on its own and *if*-clauses are used to restrict modal operators or generic frequency operators. In (5), for example, the modal operator *must* does not quantify over all the worlds compatible with the speaker's knowledge (assuming that the modal operator has an epistemic interpretation) but only those where it rains.

(5) *If it rains, the streets (must) get wet.*
Logical form: **[must[it rains][the streets get wet]],** i.e. the worlds compatible with the speaker's knowledge in which it rains are among the worlds in which the streets get wet.

The restrictor analysis of conditionals and CCs has inspired many insightful follow-up studies through which it becomes clear that the interpretation of conditional sentences is subject to a process of semantic and pragmatic modulation, that is, the semantic and pragmatic properties of a conditional can be affected by the narrow linguistic context such as the antecedent and the broad pragmatic context. As of today, there is a huge literature on the interaction between conditionals and, for example, polarity items, quantification, tense and mood (e.g. von Fintel 1999a; von Fintel 1999b; Arregui 2005). What remains understudied, however, is the

role of CCs in the modulation process, although CCs can influence the interpretation of conditional sentences in various ways.

Visconti (1996: 555), for example, argues that CCs can contribute secondary – in recent terms, "non-at-issue" – meanings concerning a "propositional attitude" towards the modified propositions, such as the speaker's epistemic, deontic or emotional evaluation of the antecedent or the consequent. In Italian, Visconti claims that the CCs *nel caso che* 'in the case that', *nell'eventualità che* 'in the eventuality that' and *casomai* 'if-ever' (made up of a simple CC *caso* 'in case, if' and an NPI *mai* 'ever') differ in terms of the speaker's attitude towards the antecedent "p" that is expressed at the level of conventional implicatures: While *nel caso che* is epistemically neutral, *nell'eventualità che* expresses a negative bias "**unlikely**(p)" and *casomai* conveys an even stronger bias, namely, "**improbable**(p)". Due to the different degrees of the bias, it is odd to use *nell'eventualità che* (or *casomai*) for modifying the antecedent that is simultaneously labeled as highly likely by the non-restrictive relative clause, whereas it is perfectly natural for *nel caso che*, as shown in the contrast of (6), from Visconti (1996: 559).

(6) ***Nel caso che /?Nell'eventualità che*** *Giampiero riesca ad affittare quella casa al mare – cosa che pare molto probabile – passeremo da lui una settimana in luglio.*

'In the case/?In the eventuality that Giampiero manages to rent that house by the sea – which he almost certainly will – we'll go and stay with him for a week in July.'

Cross-linguistically speaking, such propositional attitudes towards the antecedent can be expressed in different ways in different languages: For example, Mandarin *wanyi* is a CC derived from the adverbial *wanfenzhiyi* (lit. 'ten thousand-portion-of one', i.e. 'one of ten thousand'), and the speaker's negative epistemic bias that it conveys is mirrored in its morpho-semantic make-up. While the speaker bias with *wanyi* is triggered lexically, similar meanings can be triggered compositionally, such as the English complex CCs *in the improbable/unlikely/likely/probable event that*. Furthermore, CCs can involve an epistemic or bouletic evaluation in some languages, such as English *in the fortunate/unfortunate event that*.

In German, for example, the weakened commitment of the CC *im unwahrscheinlichen Fall, dass* "in the unlikely case that" can be detected by various diagnostics. As shown in (7), it is odd to use the CC in co-occurrence with a relative clause indicating speaker belief in the antecedent, showing that the lower commitment is conventional, in this case, triggered by the non-restricting adjective.

(7) ***Im unwahrscheinlichen Fall****, dass es draußen regnet, (#was ich glaube,) bleibt Susanne zu Hause.*
'In the unlikely event that it is raining outside, which I believe, Susanne will stay at home.'

However, the degree of commitment conveyed by some CCs can be more subtle, and thus difficult to detect straightforwardly, for example, in the contrast between the German *wenn* 'if, when' and *falls* 'if, in case'. Built on their distributional behaviors and experimental evidence, Liu (2015) proposes that *falls* conveys a negative speaker bias towards the antecedent, in comparison to *wenn*.

(8) *Wenn/Falls es draußen regnet, bleibt Susanne zu Hause.*
'If it is raining outside, Susanne will stay at home.'

a. At-issue content: If it is raining outside, Susanne will stay at home.
b. Non-at-issue content (with *falls*): Speaker suspects that it is not raining outside.

While the negative bias is triggered lexically by *falls*, it is not a conventional implicature in the sense of Potts (2005), as it can be canceled as shown in (9a) while conventional implicatures are not cancelable. Nor does it correspond to a conversational implicature as we can derive based on Gricean reasoning from a scale such as <some, all> – there is, for example, no entailment relation between *wenn* and *falls*, at least not at the at-issue dimension. Furthermore, an anonymous reviewer pointed out with (9b) that the cancelability does not always work – I will not go further in this issue due to scope reasons, as this would involve a thorough

discussion of the semantics and pragmatics of the belief predicates *believe* vs. *almost certain*. For simplicity, I will identify the bias as a secondary, i.e. non-at-issue, content that is lexically triggered but contextually cancellable.

(9) a. *Falls es draußen regnet, was ich glaube, bleibt Susanne zu Hause.*
'If it is raining outside, which I believe, Susanne will stay at home.'

b. ??*Falls es draußen regnet – und ich bin mir fast sicher, dass es das tut – bleibt Susanne zu Hause.*
'If it is raining outside – and I am almost certain that it is – Susanne will stay at home.'

To validate the claim about the negative bias, Liu conducted a production study using a 2x3 factorial design with the factors "Context" and "Connective". The Context factor has two levels, encoded in the sentence preceding the conditional sentence: Either the protagonist believes the content of the antecedent or not. The Connective factor has three levels: *wenn, falls* and a mismatching control item, e.g. *dass*. Subjects were asked to make a choice, as in the example scenario of (10).

(10) *Kathi hat morgen für einen Tag freigenommen. Sie* {***glaubt / glaubt nicht***} *dass es morgen regnet und denkt: _____es morgen regnet, bleibe ich zu Hause.*

'Kathi has taken tomorrow off. She {believes / doesn't believe} that it will rain tomorrow and is thinking: _____it rains tomorrow, I will stay at home.'

a. **wenn** b. **falls** c. dass

The findings were as follows: (1) *Wenn* was preferred over *falls* in scenarios where the protagonist believes in the antecedent and (2) *Falls* was preferred over *wenn* in scenarios where the protagonist has a low degree of belief in the antecedent. This supports the modeling of the *wenn/falls* contrast along the following commitment scale in (11).

(11) More committed $<$ *WENN p*, *FALLS p*$>$ Less committed

Another speaker commitment scale I will propose concerns NPIs. In the NPI literature, researchers have been studying three major questions: The licensing question concerns what properties characterize the contexts where NPIs occur. The sensitivity question concerns what properties make NPIs, NPIs. The diversity question concerns intra- and cross-linguistic variation, and whether or how this can receive uniform accounts. Here, I am concerned with what I will call the "postlicensing" question, namely, the interpretive effects by licensed NPIs in a sentence. The postlicensing question has been handled in the literature on biased questions triggered by NPIs. As shown in (12), the presence of the minimizer NPI "lift a finger" in the question, indicates that the speaker suspects the negation of the proposition to be the right answer.

(12) *Did John (lift a finger to) help Jane?*
a. At-issue content: Speaker asks whether John helped Jane.
b. Non-at-issue content: Speaker suspects that John did not help Jane.

The role of speaker assumption has been claimed to be important in the study of NPIs (cf. Borkin 1971; see also van Rooy 2003; Guerzoni 2004; Guerzoni and Sharvit 2007). However, to my knowledge, it has not been addressed concerning NPIs in conditionals. Like questions, conditionals create an open proposition by the antecedent, allowing contextual manipulations that lead to various kinds of speaker bias. Above, we have seen the Italian example *casomai* that is claimed to convey a lower degree of epistemic commitment than other neutral CCs – note again that *casomai* literally means 'case-ever', that is, it contains an NPI. This intuition seems to apply more broadly. For example, with an NPI in the antecedent such as (13), the speaker expresses a lower degree of epistemic commitment towards the antecedent than without the NPI. This content is non-at-issue – it does not fall into the semantic scope of the conditional, as shown in (14a). However,

unlike the case of *falls*, the speaker bias conveyed by the NPI seems less cancellable, as demonstrated in (14b), and thus might be conventional in nature.

(13) *If John lifted a finger to help Jane, he must have been in a good mood.*

a. At-issue content: If John helped Jane, he must have been in a good mood.
b. Non-at-issue content: Speaker suspects that John did not help Jane.

(14) a. (13) =/=> If John helped Jane and I suspect that he did not, he must have been in a good mood.
b. If John lifted a finger to help Jane, (#which I believe to be the case), he must have been in a good mood.

For the current paper, it suffices to see that the presence and absence of an NPI can make a speaker commitment scale as in (15).

(15) more committed <~~*lift a finger to* V~~, *lift a finger to* V> less committed

To sum up, CCs and NPIs can make non-at-issue meaning contributions that can be modeled using speaker commitment scales such as (11) and (15). In the next section, I will provide experimental evidence that these scales are psychologically real.

# 3 Testing speaker commitment scales with conditionals

In this section, I report on two rating experiments in German and English testing the speaker commitment scales, based on the following hypotheses: (1) CCs convey different degrees of speaker commitment towards the antecedent; (2) The presence of NPIs in conditionals conveys a lower degree of speaker commitment towards the antecedent. These differences can be modeled with speaker commitment scales as in (16).

(16) Speaker commitment scales with CCs and NPIs

a. More committed <*CC1, CC2*> Less committed
b. More committed <~~*NPI*~~, *NPI*> Less committed

## 3.1 Experiment 1 (German)

The German experiment used the following two commitment scales.

(17) a. CC: more committed <*wenn, falls*> less committed
b. NPI: more committed <~~*jemals/überhaupt*~~, *jemals/überhaupt*> less committed

### 3.1.1 Stimuli and design

The experiment used a 2×2 factorial design with the factors CC (*wenn* vs. *falls*) and NPI (presence vs. absence), which yielded four conditions, as in Table 1. The hypothesis was that Condition II-IV would elicit lower ratings (i.e. degrees) of speaker commitment than Condition I.

**Table 1:** Factors, conditions, and predictions of Experiment 1.

| | | CC | |
|---|---|---|---|
| | | ***wenn*** | ***falls*** |
| **NPI** | **absence** | I. neutral commitment | III. weakened commitment |
| | **presence** | II. weakened commitment | IV. weakened commitment |

Subjects were given scenarios consisting of 4 sentences (S1-S4) presented one by one: S1 sets the context; S2 contains a conditional sentence with four combinations (e.g. *wenn-jemals, wenn+jemals, falls-jemals, falls+jemals*); S3 asks the subjects to rate the degree of the protagonist's commitment to the antecedent on a 5 point Likert scale (1 = "certainly not", 5 = "certainly yes"). S4 is a comprehension question for attention check. Twenty-four test scenarios such as the sample item (18) were used with 48 filler scenarios. Half of the scenarios used the NPI *jemals* 'ever' and the other half *überhaupt* 'at all'. The dependent variable was the ratings for S3. The predictions concerning S3 were that the rating would be lower with the NPI *jemals* in S2 than without and that the rating would be lower with *falls* in S2 than with *wenn*.

(18) S1: *Melanie sucht nach einem Sommerkleid.*
'Melanie is looking for a summer dress.'
S2: *Sie denkt:* 'She thinks,'
*„Wenn ich ein schönes finde, kaufe ich es sofort."*
*„Wenn ich überhaupt ein schönes finde, kaufe ich es sofort."*
*„Falls ich ein schönes finde, kaufe ich es sofort."*
*„Falls ich überhaupt ein schönes finde, kaufe ich es sofort."*
"'Wenn/Falls I find a nice one (at all), I will buy it immediately."'
S3: *Glaubt Melanie, dass sie ein schönes Kleid findet?*
'Does Melanie believe that she will find a nice dress?'
S4: *Möchte Melanie warme Stiefel kaufen?*
'Does Melanie want to buy warm boots?'

### 3.1.2 Procedure, data analysis, and results

The experiment was set up with Ibex Farm (spellout.net/ibexfarm/). Forty-eight undergraduate students at Osnabrück University took part in the experiment in the behavioural lab of the Institute of Cognitive Science. I performed a linear mixed effects analysis of the data using R (R Core Team 2013) and *lme4* (Bates et al. 2012). The model used CC and NPI (with interaction term) as fixed effects. The random effects were intercepts for subjects and items, as well as by-subject random slopes for the effect of CC*NPI. P-values were obtained by normal approximation that has the assumption that the t distribution converges to the z distribution as degrees of freedom increase (cf. Mirman 2014).

The analysis reveals a significant effect of CC ($\beta = 0.11$, $t = 3.08$, $p = 0.002$), a significant effect of NPI ($\beta = 0.49$, $t = 14.9$, $p < 0.001$) and a significant interaction ($\beta = 0.07$, $t = 3.06$, $p = 0.002$). The results are plotted in Figure 1: As expected, the rating of S3 was lower with NPIs in S2 and the rating of S3 was lower with *falls* in S2 than with *wenn*. These confirm both scales in (17).

## 3.2 Experiment 2 (English)

The English experiment used the CCs *if* vs. *in case* based on the assumption that *in case* is the English counterpart of German *falls* – a common assumption that is widely shared in the German context. I used the NPIs *ever* and *at all* with an equal distribution over 24 test scenarios and, furthermore, included 48 filler scenarios.

(19) a. CC: $_{\text{more committed}}$ <*if*, *in case*> $_{\text{less committed}}$
b. NPI: $_{\text{more committed}}$ <~~*ever/at all*~~, *ever/at all*> $_{\text{less committed}}$

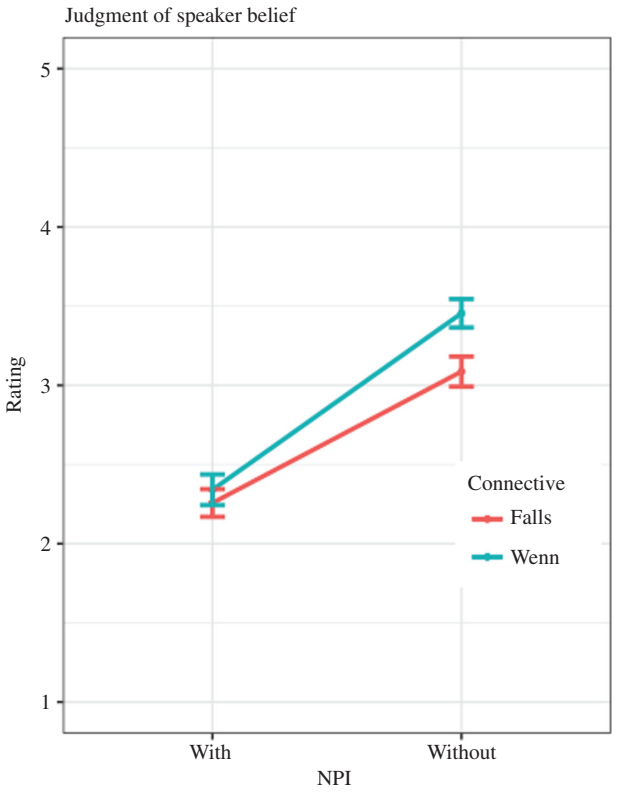


**Figure 1:** Results of Experiment 1. The *x*-axis marks the four critical conditions. The scale *y*-axis indicates the ratings of each condition.

The procedure was similar to that of Experiment 1, except that this experiment was conducted on Amazon MTurk. The stimuli, as exemplified in (20), were directly translated from those in Experiment 1 with slight changes: For example, names that were uncommon in America were replaced with more common American names.

(20) S1: *Melanie is looking for a summer dress.*
S2: *She thinks:*
*"If I find a nice dress, I will buy it on the spot."*
*"If I ever find a nice dress, I will buy it on the spot."*
*"In case I find a nice dress, I will buy it on the spot."*
*"In case I ever find a nice dress, I will buy it on the spot."*
S3: *Does Melanie believe that she will find a nice dress?*
S4: *Does Melanie want to buy warm boots?*

### 3.2.1 Data analysis and results

The data of 48 subjects were analyzed in R similarly as for Experiment 1. There was a main effect of NPI ($\beta = 0.04, t = 2.18, p = 0.029$), but there was no effect of CC ($\beta = -0.03, t = -1.65, p = 0.099$), nor an interaction (($\beta = -0.02, t = -0.94, p > 0.345$). The results are plotted in Figure 2: As expected, the rating of S3 was lower with NPIs in S2 than without, but the rating of S3 did not differ statistically for *if* vs. *in case*. That is, the NPI scale is confirmed but not the CC scale.

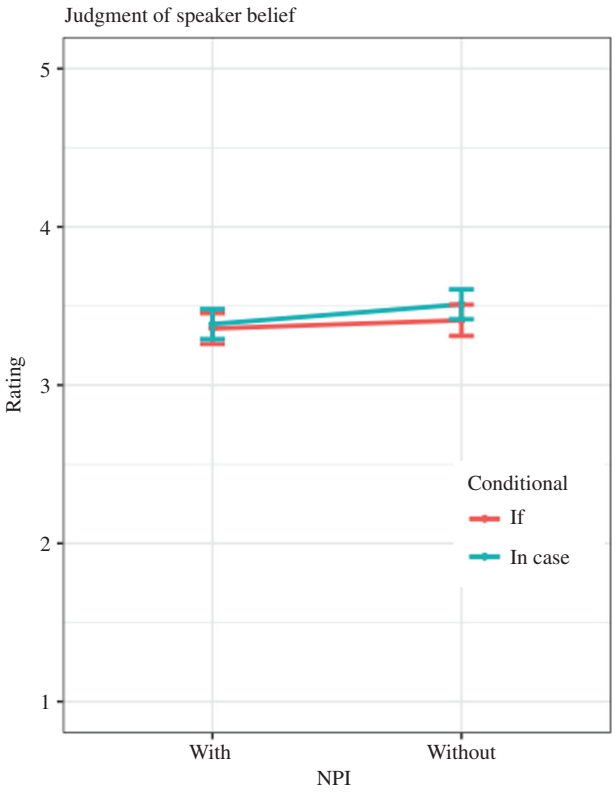


**Figure 2:** Results of Experiment 2. The *x*-axis marks the four critical conditions. The scale *y*-axis indicates the ratings of each condition.

## 4 General Discussion and Conclusion

In this paper, I discussed CCs and NPIs in conditionals that convey the speaker's epistemic bias towards the truth of the antecedent. The theoretical perspective in Section 2 is complemented by two rating studies in Section 3. Before I discuss the results in detail, I would like to briefly discuss the scope and limitations of the current study. In general, CCs can differ from one another greatly and so can NPIs. The results obtained in the current study are certainly contingent on the specific CCs and NPIs used in the experiments, thus, whether and to what extent they apply to other CCs or NPIs needs further investigation. Despite this, the study provides important novel perspectives on the semantics and pragmatics of CCs and NPIs, which I will discuss in turn.

The data discussed in Section 2 and 3 show that CCs can differ in terms of degree of speaker commitment towards the antecedent that they convey. While such meaning contributions are compositionally derivable like in the case of the German complex CC *im unwahrscheinlichen Fall, dass* 'in the unlikely case that', they are sometimes less straightforwardly detectable, for example in the example of *wenn/falls*. The current paper provides experimental evidence that the contrast, that is, the negative bias conveyed by *falls* is psychologically real and thus belongs to its lexical pragmatics, pragmatics as it is cancelable. The lack of differences between the English *if/in case* is unexpected, but shows that German *falls* and English *in case* are not counterparts. Chris Kennedy (p.c.) pointed out to me that *in case* can have quite a different meaning from *if*, such as in the sentence "In case I forget later, here are the papers." It remains an open empirical question whether English has CCs that have a similar meaning to German *falls*.

Concerning NPIs, the literature mainly focuses on the licensing, sensitivity and diversity problems. On the postlicensing question, some studies have been done on NPIs in questions, but not so much on NPIs in conditionals. The current study provides robust and cross-linguistically valid experimental evidence that NPIs in conditionals convey a lower degree of speaker commitment towards the antecedent. This result has

at least two implications: First, while most of the literature on NPIs focuses on their licensing conditions, the current study shows that licensed NPIs have interpretive effects. Intuitively, this can be seen as a sort of epistemic concord between the licenser and the licensee: Certain NPIs carry negative bias. When these occur in positive contexts, there is an inconsistency regarding the epistemic commitment of the speaker towards the modified proposition. I leave it open whether the effect exists across different types of NPIs. Secondly, there are different theories of NPIs, for example, Ladusaw's (1980) downward entailing (DE) thesis that claims NPIs to be licensed in DE contexts, e.g. contexts that allow inferences from sets to subsets. Following this, Szabolcsi et al. (2008) conducted experiments examining whether NPIs through their strengthening effect facilitate DE inferences. As their results showed no facilitation effect, they argue in favor of alternative theories of NPIs. Relating their study to the current one, I argue that the presence of NPIs facilitates (or *strengthens*) nonveridical inferences, which tentatively speaks in favor of Giannakidou's (1998) nonveridicality thesis of NPIs.

To conclude, this paper shows that the nonveridicality property of indicative conditionals is elastic in that it can be affected by the choice of CCs or NPIs. The two experiments on German and English show that in both languages, the presence of NPIs conveys a weakened speaker commitment towards the antecedent, although there is cross-linguistic variation concerning the effect of conditional connectives that calls for future investigation.

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