Interpreting *if*-Constructions: 
A Pragmatic Account of Biscuit Conditionals

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“It was a tough assignment,” said Deep Thought mildly. “Forty-two!” yelled Loonquawl. “Is that all you’ve got to show for seven and a half million years’ work?” “I checked it very thoroughly,” said the computer, “and that quite definitely is the answer. I think the problem, to be quite honest with you, is that you’ve never actually known what the question is.”


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Abstract (English)

In this thesis, I propose a comprehensive pragmatic theory of the phenomenon labeled biscuit conditionals. The pragmatic theory that I offer shows how contextual reasoning and world knowledge, reasoning about the form of an if-construction and general pragmatic pressures interact to generate the overall pragmatically enriched meaning that is conveyed by a biscuit conditional. This pragmatic theory is able to account for the wide range of biscuit readings while keeping a standard semantics for if-constructions and offers a general perspective on how natural language interpreters infer what is conveyed by the utterance of an if-construction.

The paradigm cases of biscuit conditionals are indicative if-constructions like (1) that receive a special interpretation that sets this class off of other if-constructions.

(1) If you are hungry, there are biscuits on the sideboard.

Contrary to conventional wisdom that has it that if-constructions standardly convey conditionality, i.e. that the truth of the consequent somehow depends on the truth of the antecedent, in biscuit conditionals like (1) this feature is not present. Rather, in (1), the addressee typically concludes that there are biscuits on the sideboard regardless of whether she is hungry or not. This gives rise to the question of what the meaning and function of a biscuit conditional is.

In chapter 2 I first try to carve out the properties of biscuit interpretations of if-constructions. I review semantic approaches of the phenomenon and criticize these approaches expanding on Biezma and Goebel (2019).
The starting point of a pragmatic theory of biscuit readings of if-constructions is an explanation of why interpreters take the consequent to be true unconditionally. Building and improving on Franke (2009) I argue in chapter 3 that the central criterium and trigger for a biscuit interpretation is a contextual assumption of factual independence. I show that for modeling this contextual assumption and the pragmatic inference resulting from it adequately, it is necessary to use some resources from premise semantics for so-called counterfactual if-constructions (Kratzer, 1989; Veltman, 2005).

The contextual assumption serves as a trigger and a guide for further specific inferences on the level of general pragmatic pressures. Building on Biezma and Goebel (2019), chapter 4 gives a general account of the discursive mappings of if-constructions in the QUD discourse model that arise from the quantificational nature of the semantics of if-constructions. In interaction with the general optimality maxim of communication that demands not to use complex forms in terms of processing costs without any reason, the QUD account provides the blueprint for such a reason in requiring the consequent to be a relevant answer to a suppositional question set up with the antecedent. This blueprint has to be filled somehow by the interpreter by establishing relevance via pragmatic enrichment. In the second half of chapter 4 I spell out the most frequent mechanism of enrichment for biscuits conditionals in a decision theoretic framework. I argue that the illocutionary flavor of a majority of biscuit readings is due to this kind of enrichment and is explained by a preference driven account of illocutionary force building on Condoravdi and Lauer (2012); Lauer and Condoravdi (2014) that is tightly connected to general mechanisms of practical reasoning.
In dieser Dissertation erarbeite ich eine umfassende pragmatische Theorie eines natürlichsprachlichen Phänomens, das in der Literatur unter anderem unter dem Begriff Kekskonditionale/biscuit conditionals verhandelt worden ist. Diese pragmatische Theorie zeigt, wie kontextuelle Überlegungen, Weltwissen, Überlegungen in Bezug auf die Form eines Satzes und allgemeine pragmatische Bedingungen interagieren, um die pragmatisch angereicherte Bedeutung zu generieren, die mit einem Kekskonditional kommuniziert wird. Der vorgestellte theoretische Ansatz erlaubt es, die Vielfältigkeit von Keks-Lesarten zu erklären, während die Standardsemantik für Konditionalsätze beibehalten wird. Dabei bietet der pragmatische Ansatz eine allgemeine Perspektive darauf, welche Mechanismen Interpreten natürlicher Sprachen anwenden, um schlusszufolgern, was ein Sprecher mit der Äußerung eines Konditionalsatzes kommunizieren will.

Paradigmatische Fälle von Kekskonditionalen im Englischen sind indikative Konditionalsätze wie (2), die eine spezifische Interpretation erhalten, die sie von anderen Konditionalsätzen abhebt.

(2) If you are hungry, there are biscuits on the sideboard.
Entgegen dem Standardansatz, der besagt, dass Konditionalsätze immer eine konditionale Interpretation erhalten in der die Wahrheit des Konsequens von der Wahrheit des Antezedens abhängt, ist dieses Merkmal in Sätzen wie (2) nicht vorhanden. Vielmehr folgert der Adressat typischerweise, dass Kekse auf dem Regal sind unabhängig davon, ob er hungrig ist oder nicht. Dies führt direkt zu der Frage was dann die Bedeutung und die Funktion eines solchen Kekskonditionals ist.


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Chapter 1

Introduction

Natural language speakers are able to convey different kinds and amounts of information in different utterance situations with the same sentence. As a matter of fact, speakers always mean more and intend to convey more information than just the conventional meaning of the sentence they are uttering. A major question of linguistics and philosophy of language is how to draw the line between the standing, conventional core meaning of an expression and the specific contextual features that lead to additional meaning components. The first dimension is the domain of semantics, the second the domain of pragmatics. Together, semantics and pragmatics determine the overall meaning of an utterance. Of course, there are many factors affecting the construction of meaning in natural languages. What is communicated with the utterance of a sentence is the result of a principled interaction of linguistic knowledge, world knowledge, contextual reasoning and general pragmatic pressures from communication as a cooperative effort towards coordination of mental states and, finally, actions. This dissertation aims to explore and identify the different cognitive dimensions and mechanisms that interact in the process of the construction of meaning focusing on a particular empirical domain. This domain is given by if-constructions also known as conditionals, in particular, so-called biscuit conditionals (bcs) like (3).
If you are hungry, there are biscuits on the sideboard.  

BCS have often been treated as a separate phenomenon from so called “hypothetical conditionals” (HCS) which are taken to be the stereotypical interpretation of matrix clauses with an adjunct in the form of an if-clause. An example of an HCS is (4):

If he pushes the button, the bomb will explode/explodes.

The most striking difference between (3) and (4) is that in (4) interpreters consider the consequent ‘conditional’ on the antecedent being true, whereas in (3) that sense of ‘conditionality’ is lost: there are biscuits on the counter regardless of whether the addressee wants them or not. There are also other differences between (3) and (4): in (3) we not only take away that there are biscuits on the sideboard, but also that we are invited to eat them. However, in HCS, what we often take away is that there is a possibly indirect (causal) connection of some sort between the events or the types of events that are described in antecedent and consequent. The question is what is responsible for these overall differences.

Accounting for the difference between (3) and (4) has been the focus of a rather small body of literature. Giving their striking differences, proposals in the literature often treat BCS and HCS as semantically different (e.g. Ebert et al. (2014); Iatridou (1991); Krifka (2014); Scheffler (2008); Siegel (2006) a.o.). But there are also attempts to derive the differences between BCS and HCS in the pragmatics while keeping the semantics of the if-construction unified (most prominently Franke (2009)). However, a complete proposal spelling out how differences are derived is missing.

1 Austin (1956) is supposedly the first paper where the phenomenon of biscuit conditionals was observed. The example given here is the more popular version of Austin’s (1956) own example ‘There are biscuits on the sideboard, if you want some.’

2 See e.g. Iatridou (1991).
In this dissertation I opt for the latter, pragmatic approach. I build on previous proposals (Biezma and Goebel, 2016, 2019; Csipak, 2015; Francez, 2015; Franke, 2007, 2009; Goebel, 2017; Lauer, 2015; Merin, 2007; Sano and Hara, 2014) to provide (i.) a concrete criterion of what makes some *if*-constructions receive *bc* readings, (ii.) a proposal for modeling how specific pragmatic inferences are derived in *bc*s while keeping the same semantics as *hc*s.

The major focus of this dissertation is how different types of reasoning interact with the linguistic form of *if*-constructions, especially, how discourse structure and world knowledge mesh to generate a pragmatically enriched meaning. I try to make precise these interpretational mechanisms by bringing together ideas from different areas of research. The context of this enterprise is a broadly Gricean picture of pragmatic meaning as spelled out by the QUD account of discourse (Roberts, 1996, 2012b) and how it interacts with mechanisms of practical reasoning and general and contextual world knowledge.

The analysis of *bc*s that I aim at is also meant to shed light on *hc* readings. In general, the question is how natural language speakers reason about and with *if*-constructions and which resources they use for production and interpretation. This allows for delineating the conventional meaning, but in particular to explain how the knowledge about utterances with a particular form and meaning interacts with other cognitive functions and contextual features to generate a rich and variegated set of inferences.

The dissertation is organized as follows. In chapter 2 I give an overview of the data and the key properties of *bc* readings of *if*-constructions. The guiding question is how to characterize and individuate the class of *bc*s. In general, this turns out to be quite difficult. I turn to a critical evaluation of so-called semantic speech act accounts and their characterizations of *bc*s and point to some major shortcomings of these approaches.
In chapter 3 I present the basic idea of pragmatic accounts. The starting point is that in the most frequent cases of bc interpretations the addressee infers that the consequent is true in the context unconditionally, i.e. not only under the supposition of the antecedent. This inference is furthermore intended by the speaker. The questions are how this inference as a pragmatic inference meshes with a standard restrictional semantics for if-constructions and crucially what factors are responsible for this inference to arise. Amongst others Franke (2007, 2009) has identified a contextual assumption of independence as the crucial factor for generating the inference to unconditionality. However, Franke’s (2009) formalization of the notion of independence has conceptual problems. I suggest a major improvement in spelling out the notion of factual independence using machinery from premise semantics for counterfactual if-constructions. With this at hand I aim to show that such a contextual assumption is central to all bc interpretations.

Chapter 4 takes a close look at the discursive function of bc s and the pragmatic inferences associated with them. If a biscuit interpretation of an if-construction is informationally equivalent to its consequent, as is most frequently the case, what then is the function of using the restricted form? I first look at the discursive function of if-constructions in general. Following Biezma and Goebel (2019) I spell this out in the QUD model of discourse. Along with this I look at general pragmatic pressures that are due to the form of an if-construction. I argue that the information structure in a bc interpretation requires the consequent to be a relevant answer to a suppositional question set up with the antecedent. To interpret the consequent as a relevant answer on the QUD level requires pragmatic enrichment with respect to the suppositional context. In bc s the assumption of independence restricts the possibilities for pragmatic enrichment.

I will take a look at the practical dimension of bc s that is manifest in paradigmatic cases in the second part of chapter 4. I spell out the mechanism of pragmatic enrichment for these cases with resources from decision theory. My broader aim is to show that the illocutionary level of these biscuit interpretations can be more adequately explained with a preference
driven account of illocutionary force along the lines of Condoravdi and Lauer (2012); Lauer and Condoravdi (2014) without stipulating speech act operators and their too rigid classifications of utterance force. However, 4.8 critically asks how general the provided account of particular inferences from practical reasoning for bcs is.

The conclusion in 5 takes stock and indicates topics for further research that follow from the approach and the particular solutions set forth in this dissertation.

Chapter 3 is based on published material (Goebel, 2017), but extends and improves on it to a significant amount. Parts of chapter 2 and 3 build on collaborative work with María Biezma (Biezma and Goebel, 2019) and extend the ideas put forward in the associated paper. I indicate where I build on this work.
Chapter 2

Approaching biscuit conditionals

In this chapter I first try to figure out what makes an if-construction a bc. I compare bcs to their conditional relatives, hcs, and ask which intuitions speakers associate with these interpretations. Furthermore, I try to list and evaluate different logical and distributional features that were attributed to bcs. One promising feature is that bcs entail their consequent. However, taking this as the central criterium for bcs comes with some problems. Hence, I turn to evaluating semantic accounts of bcs that concentrate on the illocutionary flavor of bcs as a central criterium. I build on and extend Biezma and Goebel’s (2019) criticism of Ebert et al. (2014) to other speech act accounts and carve out the general problems that permeate through all reviewed semantic accounts.

2.1 Speakers’ intuitions about biscuit conditionals

The subject matter of this dissertation are if-constructions like (5) and their relation and contrast to if-constructions like (6).

(5) If you are hungry, there are biscuits on the sideboard.
(6) If you touch the wire, you (will) get an electroshock.
(5) and (6) are standardly called *conditional sentences* or *conditionals*. The *if*-clause is standardly called antecedent and the main clause that the *if*-clause is attached to is called consequent. The label ‘conditional sentence’ is due to an interpretational feature that we observe in (6). The truth of the consequent is conditional on the truth of the antecedent, i.e. what is standardly conveyed with a conditional sentence is that the consequent is true in circumstances in which the antecedent is true. A speaker of (6) conveys that the addressee will get an electro shock conditional on her touching the wire. In particular, the conditional form here is used to signal that there will *not* be an electro shock in *any* (contextually salient) circumstance whatsoever. There might be other possible circumstances that might lead to an electroshock, but importantly, there are circumstances that do not lead to an electroshock. Indeed, in many contexts interpreter oftentimes infer even the stronger conclusion, i.e. that the consequent is not the case when the antecedent is not true: In case the addressee of (6) does not touch the wire, she will not get an electro shock.\(^1\) Indeed, ncs convey that there is a certain connection between antecedent and consequent and oftentimes this connection has a causal character.

Generally, apart from conveying a connection, conditionals standardly are taken to make *restricted* claims via their semantics. This means that what is claimed with the utterance of a conditional is that the consequent is true in the antecedent circumstances. That there is a connection between the antecedent and the consequent of some sort can be seen as a rationalization of the restriction.

However, in contrast, *if*-constructions like (5) do not exhibit the feature of conditionality just presented. In light of the intuitions about (6) it is puzzling that even though (5) is an *if*-construction, the interpretation is not conditional. Rather, the interpreter of (5) is licensed to assume that the consequent is true regardless of the truth of the antecedent, i.e. regardless of whether she is hungry or not. In other words, the consequent is true unconditionally and, hence, there are still biscuits on the sideboard if the

\(^1\) This inference is called conditional perfection. See e.g. Horn (2000); von Fintel (2001, 2009) a.o.
addressee is not hungry. Because both constructions – (5) and (6) – have the same form but do not share conditionality, I desist from calling the form ‘conditional’. Instead, both examples are categorized neutrally as if-constructions.

I already introduced a label for if-constructions of the kind of (5). These are called biscuit conditionals (bc’s for short). Though this name may be quite opaque at this point, I elucidate the notion at the beginning of section 2.2.

Example (7) provides an illustration of the unconditionality of bc readings of if-constructions. The response of addressee B would be infelicitous if she hadn’t assumed that there is pizza in the fridge unconditionally.

\[ (7) \quad \text{A: If you are hungry, there is pizza in the fridge.} \]
\[ \quad \text{B: Thanks. I’m not hungry. But may I take some of it to the meeting later?} \]

Indeed, a conditional, in particular a causal reading of the if-construction in (7) is implausible because of world knowledge: hunger doesn’t make it the case that there is pizza in the fridge. The phenomenon that on the informational level an if-construction like (5) conveys the unconditional truth of the consequent is in need of an explanation, especially since if-constructions are standardly taken to encode conditional information. Furthermore, a second, very much related question arises on that observation: Why does the speaker use the conditional form at all in these examples? That there is pizza in the fridge could have been communicated by just an assertion of the consequent.

As easily as natural language interpreters infer for (5) that the consequent is true regardless of the truth of the antecedent, they are able to make sense of the conditionalized form. Intuitively, what the speaker conveys is that in case the addressee is hungry the information given with the consequent helps the addressee to solve her hunger. The speaker suggests to take some biscuits and eat them. A more abstract take on this inference is that the information in the consequent is somehow relevant in the circumstances specified by the antecedent. However, the theoretical problem is to
provide a principled account of how this interpretation arises. This means to identify which factors are responsible for triggering a conditional interpretation for (6) and an unconditional interpretation for (5). A theoretical account needs to describe the rationale for using if-constructions with a bc reading despite giving rise to an unconditional interpretation.

The general aim of a theory of the interpretation of bcs is to identify the mechanisms that are at play in the interpretational process and how they are linked to the conventional semantic meaning of the particular if-construction. From the observations about conditionality, restriction and unconditionality in if-constructions two major questions arise:

1. **TQ1**: What licenses interpreters’ inferences that the consequent is unconditionally true in a bc?

2. **TQ2**: What is the function of the if-clause in a bc? Why is a form used that is so tightly associated with conditionality?

To give an answer to TQ1 is to give an account of the difference between the interpretation of the if-construction in (5) and the if-construction in (6). The presentation of the issue above might give rise to the conclusion that TQ2 is a consequence of TQ1. However, it is possible to claim that TQ2 takes explanatory priority in a theoretical account, as some accounts in fact do. Anyway, it is clear that both, TQ1 and TQ2 and their respective answers are intricately entangled, i.e. the answer to one of the questions will bear on how to answer the other question. Still, in building a theory of the phenomenon one should bear in mind that the questions are conceptually different and that both need to be answered in a way that makes clear how the respective solutions mesh.

Before trying to provide some answers and develop a theoretical account of the interpretation of bcs, a more precise characterization of the bc phenomenon has to be given. I try to do that in section 2.2. The data discussed there suggest a criterium of biscuithood that takes the unconditional truth of the consequent at face value. However, I also present reasons of why a generalization along these lines cannot be entirely adequate.
Because of these problems, I will take a look at a different attempt of characterization which forms the major branch of research into bcs. Accounts of the latter kind have suggested a criterium that springs from the intuition that the consequent is somehow discursively relevant in the antecedent circumstances and elaborate on this within the speech act theory paradigm. These accounts give explanatory priority to TQ2. In section 2.3 I present and review these theories. I argue that they either cannot explain the relevant data presented in 2.2 or are theoretically incomplete and therefore cannot explain how interpreters arrive at the relevant interpretations of if-constructions. These general shortcomings provide the rationale to take a careful and closer second look at unconditionality and TQ1 in chapter 3.

2.2 The phenomenon of biscuit readings

The class of if-constructions that are the subject of this study was introduced by way of example with (5). The label I have given to these readings is biscuit conditionals or bcs for short. This has two reasons. First, these if-constructions were first documented by J.L. Austin in his paper ‘Ifs and cans’ (Austin (1956)). There, he gives (8) as an example.

(8) There are biscuits on the sideboard, if you want them.

This example gave rise to the label ‘biscuit conditional’ that is used by several scholars. To bestow sufficient honor to the discoverer of these linguistic creatures, I carry on the tradition and use this label. Furthermore, there is a second reason to use such a rather peculiar label. Bcs are also known under the names relevance conditionals, speech-act conditionals, illocutionary conditionals, or, metalinguistic conditionals. However, I follow Siegel (2006) in her argument that all of the latter terms are theoretically incomplete.

2 Some textbooks and teachers of linguistics use more up-to-date food and drinks and label bcs ‘pizza conditionals’ or ‘beer conditionals’.

infused. Furthermore, these labels imply a rather strong and exclusive theoretical focus on **TQ2**. But the starting point of theorizing should be as neutral as possible. The term **bc** allows for this kind of theory-neutral labeling. Indeed, a description of the **bc**-phenomenon in general is already difficult, since there seems to be no (theory) independent diagnostic for **bc**s. But, to bring theorizing off the ground, one has to start with such a description. Research on **bc**s has started from (8) as the paradigmatic case and has worked its way towards examples that are less clear and do not share some properties with the paradigmatic cases. The guiding factors are mostly the differences to **hc**s. I will follow this heuristics here.

At this point let me briefly remark that I take (5) to be more canonical than the original (8). First, the antecedent in (8) is postposed. It is not clear whether this has an interpretational effect and deserves independent consideration. In this thesis I will abstract from this issue. Second, Austin’s **bc** prominently features the volitional verb ‘*want*’ which in itself is interesting and underresearched. This factor will gain importance in chapter 4, but until then I will focus on cases with less complex lexical material like (5). Third, ‘*them*’ in the postponed antecedent is anaphorical to the consequent which is a further complexity that I abstract away.

### 2.2.1 Some marks in the empirical landscape

Certainly, it is neither mentioning cookies nor food in general that makes *if*-constructions **bc**s. Rather the major feature is the contrast to hypothetical readings of *if*-constructions like (6). For some central cases, the intuitions of native speakers are quite strong with respect to whether an *if*-construction in question receives an **hc** or a **bc** reading. (9) – (16) present some uncontroversial examples of **bc** readings whereas (17) – (19) present paradigmatic **hc** readings.

(9) If you are hungry, there are biscuits on the sideboard.

(10) If you are hungry, there is pizza in the fridge.

(11) If you are thirsty, there is beer in the fridge.
(12) If you need anything later, my name is Jill.

(13) (Geis and Lycan (1993))

A: If you’re looking for the captain, he isn’t here.
B: And if I’m not looking for the captain?
A: He still isn’t there.

(14) If you want to know, she and I never got along. (Geis and Lycan (1993))

(15) If Peter asks you, I did receive his letter. (Geis and Lycan (1993))

(16) If you are out of petrol, there is a station around the corner.

(17) If Jill has done groceries, there is pizza in the fridge.

(18) If there is no gas in the tank, the engine doesn’t work.

(19) If Jack comes to the party, it will be fun.

As intuitive and easy to grasp the difference between the bc readings and the hc readings seems to be, as hard it is to pin down what is responsible for this difference. What we can say about bc’s is that on their surface they are simply if-constructions where antecedent and consequent are not really ‘connected’ to one another.

Indeed, surface similarity comes down to surface ambiguity.\(^4\) This is borne out by the fact that form and position of if-clauses in bc’s and hc’s alike are the same. Additionally, Swanson (2013) and Franke (2007) have convincingly shown that, just like hc’s, bc readings can occur with subjunctive morphology.\(^5\)

(20) (Franke 2009: 270)

a. Bonnie: Are you hungry?

\(^4\) This at least holds for English and languages that do not mark the difference structurally. It has been argued that the difference between bc and hc is indeed syntactically marked in German and Dutch. However, first, experimental data has shown that this cannot be true in its generality, see Csipak (2015). Second, I will later show that the markedness in German is not enough for excluding surface ambiguity for all cases.

\(^5\) See Romero and Csipak (to appear) for the role of tense in counterfactual biscuit conditionals.
b. Clyde: No, I’m not.
c. Bonnie: Ah, that’s a shame.
d. Clyde: Why is that?
e. Bonnie: If you had been hungry, there would have been pizza in the fridge.

(21) (Swanson 2013: 638)

a. I want to vacation in a posh hotel in London. We would have tea every afternoon, and there would be biscuits on the sideboard, if one were so inclined.
b. I wish we had decided to vacation in a posh hotel in London. We would have had tea every afternoon, and there would have been biscuits on the sideboard, if one had been so inclined.

That some subjunctive if-constructions allow for bc readings has long been neglected and even been denied. This was due to a restriction on a certain class of examples where this restriction was guided by theoretical considerations. Here, the theoretical influence on the labeling of the phenomenon (e.g. speech act conditionals) made researchers blind for certain features. Granted that not all bcs can be transposed to subjunctive versions, it is very important that the most paradigmatic case (9) allows for that. To drive the point home, subjunctive versions of bcs are evidence that the surface forms of hcs and bcs are similar up to ambiguity. This does not mean that we here have semantic ambiguity. The crucial point is that one surface form can have several readings.

Furthermore, it is indeed not principally excluded that an if-construction like e.g. (10) can receive a hypothetical reading. Though these hcs readings are implausible on world knowledge, in fictional contexts this possibility opens up again. (22) can and will be very well interpreted as an hcs where the antecedent being true makes it magically the case that the consequent is true.

6 See e.g. Lycan (2001)[p. 187] a.o.
Finally, humankind is able to build machines that can read the minds of humans. This is implemented in the mindreading fridge.
If you are hungry, there is pizza in the fridge.
\( (hc \text{ reading}) : \sim \text{The fridge detects whether you’re hungry and magically generates pizza.} \) (Rawlins, 2017)

Again, this is evidence for something like ambiguity where contextual factors determine which reading is prominent.

2.2.2 Biscuit features

Even though surface ambiguity is quite strong, there are several properties not pertaining to form that distinguish hcs from bcs. Geis and Lycan (1993) (reprinted in Lycan (2001)) provide a nice though opinionated list of these differentiating properties. In the following I present the uncontroversial features.

Modus tollens The first feature is logical in nature. hcs are standardly taken to validate the inference patterns Contraposition (23) and Modus Tollens (24).

(23) If \( p, q \therefore \) If \( \sim q, \sim p \)

(24) (If \( p, q \) \( ; \sim q \therefore \sim p \))

Hence, from the hc (17) ‘If Jane has done groceries, there is pizza in the fridge’ an interpreter can conclude, within certain contextual confines, that if it turns out that there is no pizza in the fridge, Jill has not done groceries. These inference patterns never hold for bc interpretations of if-constructions. From the bc reading of ‘If you are hungry, there is pizza in the fridge’ an interpreter will not and cannot conclude that if there is no pizza, she is not hungry. If she does conclude that the if-construction in question was interpreted as an hc from the very beginning.

\[ Where \therefore \text{ stands for standard logical implication}\]
**Negation**  The second notable feature refers to negation and the denial of *if*-constructions. Denying an *hc* with 'No, that’s not true' comes down to denying that the consequent is true in all antecedent circumstances, (25). However, the denial of a (paradigmatic) *bc* is the denial of the unconditional truth of the antecedent as witnessed by (26).

(25)  A: If Jane has done, groceries there is pizza in the fridge.
    B: No, that’s not true. Jane only buys healthy food. [It’s not the case that if Jane has done groceries, there is pizza in the fridge.]

(26)  A: If you are hungry, there is pizza in the fridge.
    B: No, that’s not true. Antonia ate it all. [It’s not the case that there is pizza in the fridge.]

**Distributional differences**  Furthermore, *hcs* and *bcs* show at least three distributional differences. First, *bcs* are not embeddable in attitude reports (27-a). They are only licensed in speech reports like (27-b) and (28).

(27)  (Bhatt and Pancheva 2006: 672)
    a. *John believes that if you are thirsty there is beer in the fridge.
    b. John said that if you are thirsty there is beer in the fridge.

(28)  Dad called. He wants you to know that if you are hungry, there is pizza in the fridge.

Second, ‘*only*’ associating with the antecedent of an *if*-construction forces an *hc* interpretation (29).\(^8\)

(29)  a. Only if you are hungry, there are biscuits on the sideboard. (¬ only the magical *hc* reading is available here: being hungry makes it the case that there are biscuits on the sideboard.)
    b. Only if Jill has done the groceries, there is pizza in the fridge.

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\(^8\) This observation is mainly due to Geis and Lycan (1993).
That ‘only if’ does not license a bc reading of an *if*-construction is correlated with the fact that bcs do not allow for conditional perfection (von Fintel (2009)). Conditional perfection is a pragmatic inference where an *if*-construction is strengthened to an exhaustive reading. The inference is that the consequent is only true in the antecedent circumstances and not true in any other circumstances.

(30) a. If you mow the lawn, I will give you 5 dollars.
   \[\sim \text{Only if you mow the lawn, I will give you 5 dollars.}\]

The latter two features, i.e. that ‘only if’ and conditional perfection exclusively arise with hc readings, is very robust. Yet, scholars did not pay much attention to these properties. In contrast, the third distributional property has quite some prominent status in the literature. It is claimed repeatedly that bcs do not allow for ‘then’ as a conjunctive particle in the consequent. Put differently, ‘then’ seems to force an hc interpretation.

(31) If you are hungry, then there are biscuits on the sideboard.
   \((\sim \text{only the magical hc reading is available})\)

However, it is not clear how general this claim is. Siegel (2006) and especially Zakkou (2017) and Biezma and Goebel (2016, 2019) argue that ‘then’ is possible in bcs after all. First, it seems that some speakers do not have problems to accept ‘then’ in bcs. Second, there indeed are examples where ‘then’ is felicitous. (32) to (34) are invoked by these authors to show that.

(32) If you need anything later, well, then, my name is James. (Siegel 2006: 190)

(33) (Zakkou 2017: 3)

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9 Note that this strengthened reading only follows under specific circumstances. von Fintel (2001, 2009) argues that probably discursive factors are responsible for conditional perfection: what is at issue is the antecedent which answers a question like ‘in which circumstances will you give me 5 dollar?’

10 See e.g. Bhatt and Pancheva (2006); Iatridou (1991); Lycan (2001) a.o.
a. If you are thirsty, there is beer in the fridge. But if you don’t like alcohol, then there is of course also tap water.

b. If you want me to lie, you look great today. But if you care for my honest opinion, then you look bad.

(34) Well, if you insist on knowing my opinion, then I think you are making a mistake marrying that guy. (Biezma and Goebel, 2019)

Hence, the ‘then’-criterium is not as strong as it is usually taken to be. However, at least in examples with single if-constructions there seems to be a strong tendency of interpreters to dislike the introduction of ‘then’ into the consequent. Anyway, more quantitative data on this issue is needed. At some points in this chapter I make use of the ‘then’ diagnostics, bearing in mind that it is quite weak and based on tendencies.

**Consequent entailment** I already noted in the beginning that one of the most striking features of bcs is that interpreters standardly infer that the consequent is true regardless of the truth of the antecedent. Put differently, on the truth-conditional, informational level of the sentence, the assertion of a bc is equivalent to the plain assertion of the consequent. Because of this it was claimed that bcs entail the truth of their consequent (ce for consequent entailment). However, note that in the following I use the term ‘entailment’ in a very broad sense, i.e. ‘entailment’ here does not necessarily mean that we here have a semantic phenomenon. Ce is rather just a term for the phenomenon just described. Ce is most central for getting grip on the class of bcs that I am trying to carve out. Hcs in contrast are rather used to avoid this kind of entailment.11 What is conveyed with the latter is that the truth of the consequent is conditional on the truth of the antecedent and that the addressee may not infer the unconditional truth of the consequent.

2.2.3 Consequent entailment: An essential characteristic of \textsc{bcs}?

\textsc{ce} gives some leverage on the distributional differences observed above. Obviously, that \textsc{bcs} do not allow for contraposition and cannot figure in Modus Tollens as well as their behavior with denial are more or less just restatements of \textsc{ce}. Two of the other data points, i.e. the ones about ‘only’ and ‘then’ are also explained by \textsc{ce}. Conditional perfection as well as ‘only if’ have the effect that the truth of the consequent is exclusively restricted to the possibilities specified by the antecedent. In contrast, \textsc{ce} is given when the consequent is true in all (relevant) possibilities. Hence, the effects of ‘only if’ and conditional perfection exclude the possibility of \textsc{ce} and are incompatible with it. A similar explanation can be given for the exclusion of ‘then’ in \textsc{bc}-readings. If one adopts the simplifying assumption that ‘then’ is only felicitous in an if-construction if a special and direct ‘connection’ between the truth of the antecedent and the truth of the consequent is (anaphorically) available or can be constructed from context, \textsc{ce} cannot hold.\footnote{Cf. Biezma (2014) However, with some modifications, her framework is compatible with ‘then’ in \textsc{bcs}. On Biezma and Goebel (2019) a direct relation between antecedent and consequent is only the default and not hardwired into the semantics of ‘then’.} This implies that there is a relation between the antecedent being true and the consequent being true. In contrast, \textsc{ce} is given iff the consequent is true regardless of the truth of the antecedent and an interpreter cannot construct a connection between antecedent and consequent. Indeed, the truth of the antecedent and the consequent in a \textsc{bc} seem to be independent and thereby the consequent is entailed.

Hence, \textsc{ce} seems to be a good candidate for being the characteristic property of \textsc{bcs}, since it is essential for most of the empirical properties that were observed. Unfortunately, there are several problems about \textsc{ce} that might ruin the hope of having found a definition of \textsc{bcs}.
Getting at grips with **ce**: conditional force and conditional imperatives

The first problem pertains to the generality of **ce** in **bcs**. The standard formulation of **ce** is that **bcs** somehow entail the truth of their consequents. This version of **ce** is exclusively suited for *if*-constructions with declarative consequents. Yet, it was observed that *if*-constructions of different sentence types allow for **bc**-readings with an inference very similar to **ce**.

(35) If I don’t see you before then, have a nice weekend. (Davison 1979: 418)

(36) If I may be honest, better call Andreas as soon as possible. (Schwa-ger 2007: 242)

(37) If I may give you some advice, don’t go. (Schwager and Kaufmann 2010: 240)

(38) Where were you last night, if you wouldn’t mind telling me? (van der Auwera 1986: 199)

(39) If he gets hungry, is there something to eat in the fridge?

(35) – (37) are conditional imperatives. These cases were claimed to be **bcs** because these sentences accomplish their illocutionary goal in an unconditional way. I.e. the wish that the addressee should have a nice weekend in (35) is performed anyway, whether speaker and addressee see each other later or not. Nonetheless, the imperative sentence type is very tricky and complex, especially because it allows for a whole range of illocutionary forces. Recently, it was claimed in Condoravdi and Lauer (2012) that this is due to a special factor, i.e. preference alignment. Building on this insight, Biezma and Goebel (2019) show that the biscuit flavor of some conditional imperatives is due to factors coming from the imperative sentence type and that the unconditionalizing effect does not come from the same source as in declarative (and interrogative) **bcs**. They identify the ‘weak’ impera-
tive force of invitations, suggestions, or wishes as a factor that leads to the unconditional reading. On their account, conditional imperatives with the ‘ce’ effect are not related to biscuit-hood. The effect has a different source. Hence, these imperatives are not a real problem for the formulation of ce.

**Biscuit conditional questions and a general dynamic notion of consequent entailment**  
Despite justified skepticism with respect to biscuit conditional imperatives, (38) and (39) definitely are examples that show that there are bc questions. They contrast with hypothetical conditional questions like (40).

(40) If Alfonso comes to the party, will Joanna leave? (Isaacs and Rawlins 2008: 269)

Isaacs and Rawlins (2008) argue that in bc questions like (40) the question in the consequent only pertains to the circumstances where the antecedent is true. Nothing is asked about the circumstances in which Alfonso does not come to the party, and hence, answers to (40) are interpreted and evaluated only with respect to antecedent circumstances. For circumstances where Alfonso does not come the question in the consequent just does not arise.

In contrast, the consequent question in (39) pertains to all circumstances, i.e. also to those where the antecedent is not true. This is corroborated by the fact that an answer to a bc question is interpreted with respect to all contextually salient possibilities.

(41) A: If he gets hungry, is there something to eat in the fridge?  
B: If he gets hungry, there is pizza in the fridge.  
B1: There is pizza in the fridge.  
B2: He won’t get hungry. He had dinner at school. However, there is pizza in the fridge.

Answer B is interpreted as a bc that entails its consequent. B1 is interpreted as an outright assertion. B2 shows that even in cases where the antecedent is false, the question about what is in the fridge arises and can be answered.
Semantically, questions are defined by the sets of their answers. Conditional questions in the sense of Isaacs and Rawlins (2008) are sets of conditional answers. For a \( \text{bc} \) question, each answer is itself a \( \text{bc} \) that entails its consequent. Hence, \( \text{bc} \) questions are real and have the flavor of \( \text{ce} \). However, to grasp \( \text{ce} \) for \( \text{bc} \) questions we need to modify the definition of \( \text{ce} \). The one given does not apply to \( \text{bc} \) questions since it is formulated in terms of truth and thereby only applies to assertions/declaratives. Following Rawlins (2017) a.o. the notion of \( \text{ce} \) has to be generalized to also apply to \( \text{bc} \) questions. This general notion of \( \text{ce} \) is best defined in dynamic terms. On this perspective, interpreting an utterance is to evaluate how the acceptance of it would update a context. On the most abstract level a context is just an information state. However, it might be helpful to think of the information state that is to be updated in a conversational setting as the information state that represents the shared information of speaker and addressee (cf. Stalnaker (2014)). A first approximation of the dynamic version then is (42).

(42) \text{An update of an information state } \sigma \text{ with a } \text{bc} \text{ dynamically entails a contextual update of } \sigma \text{ with just the consequent of the conditional.}

Dynamic entailment means that updating the context with the \( \text{bc} \) makes a further update with the consequent informationally trivial. I.e. an update with just the consequent proposition does not change the information state, if it was already updated with a \( \text{bc} \). ‘\( \sigma + \phi \)’ denotes an update of information state \( \sigma \) with the content of a sentence \( p \). Dynamic entailment then can be stated as in (43).

(43) \text{\textit{p dynamically entails q just in case for any information state } } \sigma, \\
\text{\textit{ } } \sigma + \phi + \psi = \sigma + \phi \text{ (Rawlins 2017: 9)}
CE for a BC is given if $\phi$ is a BC ($\rho > \psi$) and $\psi$ is the consequent of this if-construction. This kind of update semantics in the vein of Groenendijk (1999) and Veltman (1996) is able to specify context updates for declaratives as well as questions. The generalization of entailment in (43) to contextual entailment enables to model the fact that for BC questions the answerhood conditions are the same as those for the unconditional question. Updating the context with the BC question then comes down to updating the entire context with the consequent question.

This is a good way of describing CE. In the framework sketched, an information state is standardly represented as the set of possibilities or possible worlds that are compatible with the information discourse participants share, i.e. the worlds where all the information is true. Updating either eliminates (declaratives) or structures (interrogatives) possibilities in certain ways. The difference between BC and HC interpretations of if-constructions comes down to BCs updating the entire information state, whereas HCs only update the portion of the information state where the antecedent is true. Note, that this does not imply that the update effects have to be encoded entirely semantically. The equivalence of informational update for BCs and assertions of their consequents could also be a pragmatic equivalence.

Geis and Lycan (1993) argue that CE can take very extreme forms, where the ‘consequent’ does not even have grammatical structure ((44) – (46)).

(44) @&%#$*#111 — if you’ll pardon my Serbo-Croatian.

(45) [Holds out lighter] . . . if I may.

(46) If you want to see a piece of artistry, [makes a handstand]
Even in these cases, the generalized dynamic version of ce seems to be able to handle these cases if the consequent acts, which are not encoded linguistically, are taken to have an effect on the information state. Indeed, Stalnaker (2014) argues that events that are commonly perceived by the discourse participants have an update effect on the context state in a very similar way like utterance acts.\textsuperscript{13}

**Counterexamples to definitional ce** But even though ce in its generalized dynamic version seems to be a quite robust and general feature of bc readings, it cannot be taken to be definitional for those readings. Two strands of arguments can be given against the definitional character of ce: first, that ce is not necessary, and second, that it is not sufficient.

**ce is not necessary for a bc reading** The arguments against bcs necessarily involving ce are mainly due to Siegel (2006). Her arguments are based on two key examples, (47) and (48).

(47) If they ask you how old you are, you’re four. (Siegel 2006: 171)

(48) If you want to hear a big fat lie, George W. and Condi Rice are secretly married. (Siegel 2006: 180)

(48) does not entail its consequent in the defined sense. Rather, this sentence entails the unconditional falsity of its consequent. Yet, it is not clear how to capture this inference. Here, the dynamic characterization does not help much, because it is about the update with the plain consequent and not with a pragmatically enriched version where the knowledge that the consequent counts as a lie influences the interpretation.

The case about (47) it slightly different. Siegel (2006) only refers to one particular bc reading where the utterance of (47) is interpreted as a command or request to lie. This reading arises for example in the following context. An adult speaker wants to pay a lower price at the entrance of a

\textsuperscript{13} His standard example is a goat walking into a room. If two agents are aware that the other observes this, the information that a goat walked into the room becomes a shared belief.
theme park. The threshold for the low price is the age of five. It is common knowledge that the child knows that it is six. Hence, with (47), the adult asks the child to lie if asked. It was not noted in the literature yet that in another context a classical bc reading arises. Assume a context where it is crucial that the child knows and utters her exact age, e.g. on the first day in kindergarten. It is common knowledge between discourse participants that the child might not know its age. In this case a classical bc reading arises where the consequent is entailed and it is conveyed unconditionally that the child is four. The problematic case is the first scenario. In the entrance context, there is no ce in the usual sense. If there is some similar inference, then it is that the consequent is false unconditionally. But even this construal is faulty, since this is not conveyed by the utterance of (47). As is clear from the contrast with the scenario where a classical bc reading arises, it is a precondition of the ‘command to lie’-reading to arise that the consequent not being true (unconditionally) is already established prior to the utterance. Hence, there is no ce in this example.

A possible response to these cases against the hypothesis that ce is an essential ingredient to biscuitness might be to just exclude (47) and (48) from the class of bcs. Still then, one has to give at least a tentative explanation of those cases. The general point of a theory of bcs is to explain the difference between hc readings and bc readings. Are (47) and (48) hcs then? Let’s run our tentative diagnostics for bcs from the preceding section. Though, it is debatable whether one can insert ‘then’ into (47) or (48), they definitely do not allow for contraposition or modus tollens. The examples also are not conditional in the intuitive sense. Furthermore, even though responses of the form ‘No, that’s not true’ seem slightly degraded, if accepted they target the content of the unconditional consequent. Finally, the ‘only if’ versions of these examples are infelicitous. Hence, (47) and (48) satisfy most features of bcs and are obviously not hcs. So, the question is what are they then? Since they share many of the properties of standard bcs it might be worthwhile then to try to find a unified criterion that would count them amongst the class of bcs.
**CE is not sufficient for a BC reading: factive concessives, factual conditionals and unconditionals** But there is a further problem with the assumption that CE determines biscuithood. CE on its own seems not sufficient for a BC reading to arise. The following examples are if-constructions or close relatives that exhibit CE but intuitively do not mesh with the paradigmatic examples. These non-BCs with CE point towards an additional factor that is responsible for biscuithood.

Franke (2009) mentions two cases where if-constructions entail their consequents, but where no intuitions of BC readings arise. First, there are if-constructions like (49) and (50) that are termed factive concessives by Geis and Lycan (1993).

(49) This is the best book of the month, if not the year.

(50) Some if not all of my friends are metalheads.

Both of these examples are HCS, yet, both if-constructions entail their consequent. In a more canonical form (50) is 'If not all of my friends are metalheads, some of them are'. The consequent is entailed in these examples since the negation of the antecedent logically entails the consequent. If (50) is schematized as \( \neg p > q \), for the case at hand the discourse participants presuppose \( p \subseteq q \). It is this logical relation (given by quantification) that is responsible for the consequent being true unconditionally. Intuitively, these examples are not like the paradigmatic example (9). But what is the reason for this? (49) and (50) seem to share many of the properties that were described in the preceding section. So, why do speakers not have biscuit intuitions about these examples. The answer that I give in chapter 3 pertains to the source of CE. In (49) and (50) this is the entailment relation between \( p \) and \( q \). But the source in BCs – I am going to argue – is different. Due to this, there are no BC intuitions in (49) and (50).
A second class of consequent entailing if-constructions that often times receive hc readings are so-called factual conditionals. This category describes uses of if-constructions where the truth of the antecedent is already established like in (51) and (52).

(51) A: I have such a bad cold.
    B: Yes, you are sneezing so much. If you have a cold, you have to stay in bed for the next days.

(52) A: Kim is not coming.
    B: If Kim is not coming, I gonna go home.

Both utterances of if-constructions in (51) and (52) are hcs. But the effect on context is the same like the plain assertion of the consequent, i.e. the consequent is entailed. This is due to the antecedent already being accepted in the information state that the if-construction is to update. ce then follows by modus ponens reasoning.

As a third case at hand, ce in bcs contrasts with ce in unconditionals. Unconditionals convey the unconditional truth of the antecedent and give rise to a global update of the entire information state. These constructions, exemplified in (53) and (54), are analyzed in detail in Rawlins (2008).

(53) Whether Alfonso comes to the party or not, it will be fun.
    \( \Downarrow \) The party will be fun.

(54) Whatever happens, I will finish this chapter.
    \( \Downarrow \) I will finish this chapter.

Franke (2009) calls this kind echoic conditionals. The term ‘factual conditionals’ is taken from Iatridou (1991). It is important to point out that there are two kinds of factual conditionals. One, where the speaker distances herself from the content of the antecedent and one, where the antecedent can be taken to be common ground.

See Goebel (2017).

Even though unconditionals do not feature the word ‘if’, Rawlins (2008) shows that they are indeed conditional constructions.
If ce were sufficient for biscuithood, (53) and (54) would be predicted to receive bc readings. But this is obviously not the case. Consequent entailment in an unconditional is due to the fact that each alternative in the antecedent is assessed with respect to whether the consequent holds for it. Hence, the meaning of an unconditional can be paraphrased by an exhaustive sequence or conjunction of if-constructions.

(55) Whether Alfonso comes to the party or not, it will be fun.  
→ If Alfonso comes to the party, it will be fun, and if Alfonso doesn’t come, it will be fun. (Hence, it doesn’t matter whether he comes.)

A bc does not encode such a quantification over alternative antecedents. However, in bc cases where ce holds, such an exhaustive sequence of if-constructions can be inferred from the utterance of a bc. But it is certainly not conveyed like in an unconditional. This fact is even clearer when we look at what Rawlins (2008) terms biscuit unconditionals.

(56) Whether you’re hungry or not, there’s a sandwich in the fridge.  
(Rawlins 2008: 95)  
→ If you’re hungry, there’s a sandwich in the fridge, and if you are not hungry, there is a sandwich in the fridge.

(57) Whatever you’re hungry for, there is some in the kitchen.  
→ (For contextually salient food X, Y, Z) If you’re hungry for X, there is some in the kitchen, and if you are hungry for Y, there is some in the kitchen, and if you are hungry for Z, there is some in the kitchen.

(58) Whatever happens, my mobile number is pinned on the fridge.

Because of the semantics of unconditionals, each of (56) and (57) can be paraphrased with a sequence of if-constructions. But whereas in the case of hypothetical unconditionals ce crucially depends on the sequential paraphrase, this is not the case for biscuit unconditionals. Each of the if-
constructions in the paraphrase of a biscuit unconditional is itself a bc.\textsuperscript{17} In particular, if-constructions in the paraphrase on their own already give rise to ce. Hence, ce in bcs cannot be explained by the paraphrase with a sequence of if-constructions.

The preceding cases have shown that ce on itself cannot give a sufficient characterization of bcs, i.e. does not pick out the intuitive class of bcs. However, in chapter 3 I argue that the case is not hopeless. Indeed, what got clear from the examples that are not bcs but exhibit ce is that ce can have different sources. The theoretical task is to identify the source for bcs and to do that in a way that leaves room for Siegel’s (2006) cases of bcs where we do not observe ce. But before undertaking this enterprise, in the next section I evaluate a different approach to bcs that is theoretically not focused on TQ1.

### 2.3 Speech act theories: bcs as conditional speech acts?

#### 2.3.1 The general idea of speech act theories

The last section presented some problems for taking ce to be definitional for bcs. The alternative branch of theoretical accounts of bcs – which is the longest tradition of analysis – takes a different starting point. Rather than asking what licenses the ce-inferences (TQ1) first, these accounts directly start with TQ2, i.e. the question of what the function of the conditional form is.

\textsuperscript{17} At least each element of the sequence is similar to a bc: ‘If you are not hungry, there is a sandwich in the fridge’ seems to be degraded, since interpreters typically are not able to infer how the consequent is relevant to the antecedent circumstances. However, also this if-construction exhibits ce and this is all I need to show the difference between unconditionals and bcs.
Crucially for these accounts, the difference between hcs and bcs is semantic. The basis for answering TQ2 within these accounts are intuitions and observations with respect to, first, the if-clause in a bc making the consequent somehow discursively or contextually relevant, and, second, the fact that most bcs invite some kind of (performative) inference, e.g. an invitation to take some biscuits. Consider our paradigmatic example of a bc, repeated below as (59).

(59) If you are hungry, there is pizza in the fridge.

\[ \therefore \text{Addressee is allowed to take the pizza} \]

The first observation is that the information that is provided by the antecedent is only relevant if the addressee is hungry. In case the addressee is not hungry, the information from the consequent is more or less useless for her. Secondly, (59) is standardly understood as a permission, suggestion, or invitation to take and eat some of the pizza. Importantly, these performative inferences are restricted to the antecedent circumstances, i.e. they are conditionalized. Whether the addressee is allowed to take pizza for some other purpose than easing her hunger is not specified with the bc.

Both of these observations are taken to be evidence for a performative element in bcs. In the accounts described in the following this performative element is tracked to the kind of speech act that the utterance of a bc performs. bcs like (60), (61) and (62) - examples that these accounts often focus on - give indeed rise to specific performative politeness effects.

(60) I’ve been out buying David’s present, if you care. (Lycan 2001: 188)

(61) If you don’t mind, I’m trying to read. (Lycan 2001: 188)

(62) I paid you back yesterday, if you remember. (Rawlins, 2017)

Speech act accounts claim that the if-clause does not introduce a condition on the truth of the consequent. Rather it introduces a condition on the relevance, felicity or appropriateness of the speech act indicated or performed with the consequent.
Following work on speech acts in the tradition of Searle (1969) speech act accounts of _bc_ s take relevance and felicity to be encoded in the appropriateness conditions of a speech act. The basic move of the speech act theorist is then to conceive of _bc_ s as conditionalized speech acts. The distinction between _hc_ s and _bc_ s is then captured in a difference with respect to the related speech act.

One way to paraphrase the basic idea with explicit reference to a speech act is to say that (declarative) _bc_ s are _conditional assertions_ where the consequent is only asserted for the antecedent circumstances. This can be made more precise in terms of a difference in scope of the antecedent in a _bc_ and an _hc_. Where in _hc_ s the _if_-clause scopes under a speech act (ASSERT) and attaches to the consequent, (63), in a _bc_ the _if_-clause takes scope over the speech act, (64). Hence, the _if_-clause restricts the speech act and not the content of the consequent.

(63) \text{ASSERT[If no one has eaten them, there are biscuits on the sideboard.]} \\
(64) \text{If you are hungry, ASSERT[there are biscuits on the sideboard].}

Standardly, it is assumed that for declarative _if_-constructions the speech act is one of assertion, hence ASSERT. This is due to the assumption that declaratives by convention encode assertive force. The most important task for a speech act account then is to spell out what ASSERT represents. There seem to be at least two possibilities: either ASSERT is an actual speech act or it is an abstract illocutionary force operator. More outdated conditional speech act accounts seem to claim that ASSERT is just a real speech act that determines the illocutionary force of the entire conditional, viz. conditional assertion. Hence, (64) is a conditional speech act. On this

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18 A short note on the notion of a conditional assertion. Though the idea that _bc_ s are conditional assertions goes back to DeRose and Grandy (1999), they are not speech act theorists in the sense presented here. DeRose and Grandy (1999) claim that all indicative conditionals are conditional assertions/speech acts. The view presented here might be rather found in van der Auwera (1986).

19 A detailed syntactic account along these lines is presented in Iatridou (1991).


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picture, bcs and hcs are ‘primitively’ distinct in being different types of acts by having categorically different kinds of illocutionary force, conditional or unconditional. An hcs has unconditional force since the speech act scopes over the entire conditional. A bc has conditional force.

With this kind of direct approach to speech acts many issues remain rather obscure. First and foremost, such an account does not provide an explanation, but at best a re-description of the phenomenon in restating that there is a categorical difference between hcs and bcs that amounts to a difference between plain speech acts and conditionalized speech acts. Furthermore, actual speech acts are not compositional. The claim made rather amounts to the presumption that there are two primitive kinds of if-constructions, even though both kinds involve an ‘if’ clause and the forms are ambiguous on the surface. Another counterargument starts from the assumption that utterances and the performed speech acts are acts just as any other acts. That speech acts are ‘just’ acts is one of the key insights of speech act theory since Austin. But under the assumption that there are two categorically distinct kinds of speech acts, one has to ask, what a conditional act is supposed to be. In the domain of non-linguistic acts we just cannot make much sense of conditional acts: Either the agent acts, or he does not act. There is no room for conditional acts. Hence, there is a serious explanatory lacuna. Much more work on the side of the conditional speech act advocates would have to be provided here.

In light of these difficulties, it seems to be a better bet to claim that ASSERT is an abstract illocutionary force or speech act operator. At this point speech act theories of bcs turn into full-fledged semantic theories of bcs. The difference to hcs then is explicitly spelled out as a difference in scope with respect to operators that are encoded semantically. However, most theories do not say what the semantic and logical features of a speech act operator are. This is important because it is the fundamental claim that this operator gets restricted by the antecedent proposition. But there is

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21 On such an account one could no longer speak about the scope. However, there seems to be no other way of talking about the difference.

22 This line of counterargument is to be found in Merin (2007) and Franke (2009).
almost no hint of how this interaction can be spelled out compositionally, because the logical structure of a speech act operator is not clear. Logical operators standardly quantify over some domain and this quantification can be restricted. But can speech act operators be conceived of in the same way?

2.3.2 Potential literal acts (Siegel, 2006)

Siegel (2006) is an attempt to understand speech act operators in the same sense as other operators, i.e. as quantifying over some domain. Her basic move is to shift away from actual speech acts and also in a way to shift the theoretical burdens of speech act theories by introducing an ontological category of (potential) literal acts. The operator that the if-clause attaches to does not make or lead to an actual speech act. Rather, this operator quantifies over potential literal acts as abstract objects. The use of a be then indicates that such an act would be relevant and appropriate under the conditions specified by the antecedent. Potential literal acts are to be conceived of as composed of a propositional content and an illocutionary force potential. The paraphrase of a paradigmatic be then is as in (65).

(65) If you are hungry, there is a potential relevant literal assertion/act with the content ‘there is pizza in the fridge’.

The first problem is that from a semantic prespective, cs conceived of as if-constructions with a literal act operator in the consequent are almost always true. It seems that there always exist a potential literal act in the space of these abstract objects that makes the claim true. It is quite easy to imagine a literal assertion in a possible circumstance for any possible consequent. The explanatory power of Siegel’s (2006) account then hinges on the claim that the potential literal act has to be relevant. However, Siegel (2006) does not give an explication of this notion. The problem is that, generally, in speech act theories the notion of relevance is understood in an intuitive way as conversational or discursive relevance. This is rather

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23 See (Siegel 2006: 170).
a pragmatic notion than a semantic one. Even if we could make sense of relevance of an abstract object of a potential literal act, the question remains how this notion links to the intuitive understanding of relevance as a pragmatic notion. And since the introduction of quantification over potential literal acts in Siegel’s (2006) account is unrestricted and, in a way, trivial, the interpretation of a bc heavily depends on how these abstract objects are linked to relevance. In the end, it seems that the latter notion, though not analyzed, is doing most of the work.

Another problematic point of this framework is the following. Even though – as we have seen in section 2.2.3 – Siegel (2006) convincingly argues that not all bcs entail their consequent, her account does not provide any explanation of the fact that in most contexts addressees infer that the consequent holds unconditionally. On Siegel (2006) an utterance of a bc asserts something along the lines of (66).

\[(66) \text{ASSERT} \text{ If you are hungry, [there is a relevant literal act of saying] there are biscuits on the sideboard.}\]

The potential literal act account cannot explain what it is that allows to infer the unconditional truth of the consequent proposition in this case, but not in the problem case (47). This problem gets even clearer when we consider the generalized dynamic notion of ce. There are bc-questions like (67).

\[(67) \text{If John is hungry, what is in the fridge?}\]

Siegel’s (2006) paraphrase would be something along (68).

\[(68) \text{If John is hungry, there is a potential literal act of asking ‘what is in the fridge?’}.\]

But intuitively, the question is asked unconditionally (put differently, each answer to the bc question is a bc itself). It seems as if the question indeed has global force, even though it might not be relevant in the non-antecedent circumstances.
Even if \textsc{bc} questions are dismissed, \textsc{ce} is a problem for Siegel’s (2006) account. The standard move of speech act operator accounts is to explain \textsc{ce} in the following way. Since the \textit{if}-clause does not attach to the (truth-evaluable) content of the consequent, but only to the speech act that targets the consequent, truth of the consequent is not restricted to antecedent circumstances. Only the further speech act conditions that guide felicity and relevance are restricted. Insofar, the content of the consequent is put forward unrestrictedly, i.e. unconditionally. Thereby, the hearer infers that the content of the consequent holds unconditionally.

A possible adaption of this line of argument to Siegel (2006) is given in the following. A potential literal act need not have true content, but assuming an intuitive understanding of the notion of relevance, relevant assertions have to be assumed to be true. And this assumption of true content of the potential literal act is then supposed to project out of the restricted context. However, this is problematic. First, again, it is the assumption of relevance doing the work here and, secondly, the account on its own does not provide an explanation of why the projection of truth is licensed. It seems that the theory needs a supplementing independent pragmatic explanation.

\textbf{2.3.3 Conditional commitments (Krifka, 2014)}

Similar problems arise for Krifka’s (2014) account of \textsc{bc}s. His framework provides a formal and compositional characterization of speech act operators in general. Because of its formal complexity I here only lay out the basic idea that pertains to \textsc{bc}s. Every utterance is made on the background of specific commitments that each discourse participant has. This can be represented as the commitment set of an agent, i.e. the propositions she is publicly committed to. Each utterance of an agent adds a commitment to this set. A commitment set can evolve in several ways. This is represented by the commitment space, i.e. all the commitment sets that the actual commitment state can evolve into. A \textsc{bc} as a conditional assertion with its speech act operator in the consequent acts on this space in that it
conveys a *conditional commitment*. This means that the speech act in the consequent only has force for those future commitment states where the speaker is committed to the antecedent. Krifka goes on to claim that “If not applicable because the addressee happens to be not hungry, then nothing will change, that is, the assertion is not made.” (Krifka 2014: 85)

But how, on this picture, is ce to be explained then? Indeed, it is not the case that the speaker is only committed to the content of the consequent if the antecedent is true, or respectively, if she becomes to be committed to the content of the antecedent. Example (69) shows that the speaker is committed to the *unconditional* truth of the consequent, even if the antecedent is not true. Speaker A is blamed, even though a speech act theory along Krifka’s (2014) lines would predict that the assertion only takes effect if the antecedent is true.

(69)  
A: If you are hungry, there are biscuits on the sideboard.  
B: No, thanks. I’m not hungry. But I gonna put the biscuits in the kitchen, so that the dog cannot get them.  
C: *After looking around for some time.* Hey, there are no biscuits. Did you lie to me?

Here, a point applies that was put forward by (Dummett 1991: 115) when he discusses the distinction between force and content. He explicitly criticizes conditional assertion theories of indicative conditionals in general when saying:

“Nor is it a good description to say that [the speaker] asserted the consequent conditionally, as if he had handed his hearers a sealed envelope marked ‘Open only in the event that ...’.”

This criticism holds as witnessed by (69) even if we take the conditional speech act theory to be restricted to *bc*). An account constructing conditional assertion as conditional commitment, first, has to explain why there is unconditional commitment involved in *bc*). In the case of the antecedent being false, it is not that nothing has been said, conveyed, or, that
the speaker is not committed to anything. Rather, she is committed to the unconditional truth of the consequent. Hence, a speech act theory would have to provide an independent characterization of why \( CE \) arises since the framework on its own does not provide this explanation. Second, the claimed conditionality of the speech act has to be made more precise.

It is explicitly claimed by Krifka (2014) that what is restricted is the relevance of the speech act. But again, the same criticism that holds for Siegel (2006) applies here. The accounts should be able to spell out how relevance and the speech act operator are related. However, this is not provided.

**CE as a problem for speech act theories** For speech act theories there seem to be two theoretical options for the explanation of why the hearer is licensed to infer the unconditional truth of the consequent and why the speaker indeed is committed to the consequent being true. The first option would be to explain \( CE \) as pragmatically induced, very much like a conversational implicature. But clearly, \( CE \) cannot be a conversational implicature as usually defined since it is not cancelable. Hence, conventional implicature as an alternative comes to mind. The second option would be to claim that there are multiple speech act operators at play, i.e. one speech act that gets restricted by the antecedent and one that puts forward the unconditional content of the consequent. Either option requires substantial theoretical elaboration, but what unifies both solutions is to assume more than one level of conventional meaning to solve the problem about \( CE \).

One way to spell out the second option – multiple speech acts – would be to claim that the assertion operator scopes high and it is something like an additional suggestion operator that gets restricted by the antecedent, as in (70).

(70) \( ASSERT \) [If you are hungry, \( SUGGEST \)] there are biscuits on the sideboard.
Since the *if*-clause only applies to the suggestion operator, the consequent is plainly asserted. However, making this suggestion compositional is a non-trivial matter, because we are faced with the problem whether the assertion operator also applies to the restricted suggestion or not. More abstractly, one would have to explain whether or not the two speech act operators interact. To get *cf* right they should not be allowed to interact. As far as I know, there is no spelled out account that goes this way. A second and more general problem about this potential solution is that the intended suggestion in (70) is not a suggestion that there are biscuits. Rather, it is a suggestion to eat the biscuits. I.e. the content of the consequent and the content of the speech act differ. Again, the speech act theorist would have to provide an explanation of how this difference comes about, i.e. why the speech act is understood in this particular way and how it is recovered even though there is no linguistic material indicating it.

2.3.4 Solving *cf* with multiple speech acts (Ebert et al., 2014; Scheffler, 2008)

I here briefly want to sketch two recent alternative speech act/semantic accounts that try to account for *cf* and bypass or solve the problems about compositionality within the two options just sketched. Scheffler (2008) analyzes *bc* s in a multi-dimensional account of meaning. The framework follows basic ideas of Potts (2005) where it is claimed that conventional implicatures introduce content to additional levels of conventional meaning. Hence, the conventional meaning of some expressions can have several independent layers. Examples are slurs and utterance modifying adverbials a.o. It is claimed that the at-issue content and the conventionally implicated content of an utterance are separated on different independent semantic levels of meaning. On Scheffler’s (2008) account the *if*-clause of a *bc* does not contribute to the at-issue content of the *if*-construction. The at-issue content, i.e. what is conveyed on the level of information, is just the consequent. The *if*-clause contributes or attaches to the conventionally implicated content. Hence, a *bc* ‘*if* *p*, *q*’ asserts *q* outright and conventionally
implicates if \( p \), then UTTER \( q \). Shortcomings of this account are, first, that as in most speech act accounts the workings of the UTTER operator are left unclear. Second, it is not clear how the interpreter determines whether the antecedent attaches at the content level (hc) or at the conventional implicature level (bc). Notably, in Scheffler (2008) ce is build into the semantic makeup of the bc construction and hence is predicted to arise with all bcs.

Ebert et al. (2014) put forward a semantic speech act account where ce similarly follows from the semantics. It is argued that the if-clause in every if-construction introduces a topic. This function is spelled out by the if-clause encoding a topic introducing speech act operator. The consequent is also taken to structurally contain a speech act operator like ASSERT (or some other speech act). Every utterance of an if-construction thereby semantically performs two speech acts. The difference between hcs and bcs on Ebert et al.’s (2014) amounts to a difference in the interaction or integration of the two operators in an if-construction. On the formal level this is captured by the binding behavior of the operators. In an hc the consequent predicates something about the topical worlds introduced by the antecedent act. In a bc the consequent is a stand alone proposition that makes a claim about the actual world. Since antecedent and consequent speech act are not semantically related by binding in a bc, the truth of the consequent is asserted outright. Ebert et al. (2014) take this semantic difference between hcs and bcs to be justified by data from German that I discuss in due course in section 2.3.5. Ebert et al. (2014) furthermore claim – similarly to other speech act accounts – that the interpretational link between antecedent and consequent in bcs is provided by conversational relevance.

Both theories, Scheffler (2008) and Ebert et al. (2014), encode ce into the semantic structure of if-constructions that are interpreted as bcs. I.e. ce follows from the logical form of the respective if-construction and always arises with bcs. But this brings with it a range of problems of which I will only discuss two.\(^{24}\)

\(^{24}\) For a more in-depth criticism, see Biezma and Goebel (2019).
The first problem is that \textit{prima facie} neither Scheffler (2008) nor Ebert et al. (2014) can explain Siegel’s (2006) counterexamples to $ce$, (47) and (48) repeated as (71) and (72) below.

(71) If they ask you how old you are, you’re four.

(72) If you want to hear a big fat lie, George W. and Condi Rice are secretly married.

Scheffler (2008) does not discuss these examples. Her account cannot handle these examples since outright assertion of the consequent content is build into it. This is, semantically, every $bc$ entails its consequent. This is clearly not true for (71) and (72). However there might be a solution. Certainly, Scheffler (2008) does not argue that every at-issue content is put forward assertively. Generalizing, in her framework there is one speech act that is unrestricted by the $if$-clause (at-issue content) and one that is restricted by the $if$-clause (not-at-issue content). With this, the same argumentative strategy is open to her that is elaborated on in Ebert et al. (2014). It is argued that in both cases, (71) and (72), a different speech act from asserting is involved, a speech act that does not target truth. Hence, $ce$ does not arise in these putative counterexamples.

Ebert et al. (2014) assume that (71) is an indirect speech act of commanding and commands are not truth evaluable. However, this argument was already anticipated and countered by Siegel (2006). She argues that (71) cannot be a command. On the assumption that imperatives typically encode commands, Siegel (2006) argues that commands license specific responses. In particular, commands can be rejected with ‘\textit{No, I won’t do that}’. But the $bc$ (47) does not license this response as the paraphrase in (73) would have it. Hence, the $bc$ cannot be a command.

(73) If they ask you how old you are, (I order you to) say you’re four.

(74) a. If they ask you how old you are, you’re four.
   b. #No, I won’t.
   c. No, I won’t say that.
However, Ebert et al. (2014) counter Siegel’s (2006) argument by claiming that (74-c) in contrast is a felicitous reply. Ebert et al. (2014) claim that this is due to the indirectness of the command in (71). They go on to argue that a reply to an indirect command has to make explicit what is commanded indirectly, i.e. the act that the speaker wants the addressee to do. (74-b) on this understanding is an elliptical construction. And it is not felicitous because there is no antecedent for the ellipsis if the speech act in the consequent is an indirect speech act. In contrast, (74-c) makes the implicit, indirect element explicit. It is non-elliptical and furthermore a licit reply to a command. Ebert et al. (2014) conclude that (71) is a command after all.

But Ebert et al.’s (2014) counterargument is quite obscure and ad hoc. It rests on the possibility of having an ‘indirect’ speech act operator. As well as for regular speech act operators, it is not at all clear what an ‘indirect’ speech act operator should be. How can indirectness be encoded semantically at all?

At this point, Ebert et al.’s (2014) account runs into a similar problem that was pointed out above when I discussed the option of introducing a speech act operator for declarative if-constructions that are not assertions. E.g. a speech act operator SUGGESTION. One of the problems is that with the paradigmatic bc (59) it is not suggested that there are biscuits, i.e. the suggest operator does not directly take the propositional content of the consequent. Rather, it is suggested to take or eat some of the biscuits. Similarly with (71). If there is a semantic speech act operator COMMAND, it is clearly not interpreted as a command that the addressee is four. It is interpreted as a command that the addressee says that she is four. Ebert et al. (2014) seem to aim for encoding this enriched meaning somehow into the ‘indirect’ element of their indirect command speech act operator. Again, it is not clear how this should be made intelligible. The general worry with this solution is that speech acts and, in particular, speech act operators seem to multiply endlessly thereby loosing any explanatory power.
There is another major problem with this argumentation as is observed in Biezma and Goebel (2019). The accounts in Scheffler (2008) and Ebert et al. (2014) share the general prediction that the speech act in the consequent is made outright. Under the assumption that the speech act in the consequent is a command, both frameworks predict, that it would be an outright, unconditional command. E.g. on Ebert et al. (2014) the operator for the (indirect) command is not integrated with the topical speech act. This prediction is obviously false: (71) is not interpreted as a command to say that the addressee is four in any case, i.e. unconditionally. If the addressee goes about and just tells the personal that she is four without being asked, she has clearly not understood (71). Hence, Ebert et al. (2014) still have a problem with ce, even if one concedes their argument about the commanding force.

Furthermore, Ebert et al. (2014) cannot offer an explanation of why (71) can have two different biscuit interpretations. This was discussed in section 2.2.3 when I introduced the example. (47) can be either interpreted as a classical bc conveying the information in the consequent outright or interpreted as an incentive to lie. The first interpretation as a classic bc is clearly not a command. On the semantic account with speech act operators we end up with a plethora of logical forms for the sentence in (71), i.e. an hc-LF, a classical bc-LF, and a bc-lie-LF. Since there are no surface indicators, the interpreter will have to take into account contextual knowledge and use general pragmatic mechanisms to arrive at the right and intended interpretation. This is not accounted for in Ebert et al. (2014) at all. However, this is the fundamental problem about the different possible interpretations of if-constructions. Indeed, we could ask what the advantage of semanticizing speech acts is, if in the end, the interpreter has to engage in pragmatic reasoning anyway. Why taking the detour through semantics and not apply pragmatic reasoning in the first place? I will come back to this issue later.

A further counterargument against the multiple speech acts approach of Ebert et al. (2014) is that it is not general enough. Consider context (75), where the father recapitulates the time spent in the funpark.
I wanted to get in for the lower price and made this clear to Jacky. And: If she was asked by the staff how old she was, she was four.

The conditional is not used to make a command here. It is a description and the addressee can infer that Jacky followed the command (or suggestion) to say that she is four. Clearly, the sentence as uttered in (75) is not a command to the addressee, because it refers to the past. And how can a speech act be made with respect to a past situation? Ebert et al. (2014) and also Scheffler (2008) cannot cope with past tense examples at all, since there are no past tense speech acts. There seems to be no way for these accounts to analyze sentences like (75).

Ebert et al.’s (2014) approach to the lie example (72) is similarly based on the assumption of a plethora of non-standard consequent speech acts. With respect to (72) Ebert et al. (2014) claim that

“the speech act of the consequent clause cannot be a run-of-the-mill assertion since it has been explicitly classified as a lie beforehand [...]” Ebert et al. (2014)[p. 361]

The suggestion is to treat the speech act in the consequent as a speech act of lying or falsely asserting. However, it is very difficult to make sense of this suggestion. Let me briefly note that it is essential for the notion of an illocution or speech act that the force can be identified by and should be identifiable for the interpreter. But a lie is the exact opposite: an assertion which is a lie shall not be recognized as such or at least, that it is a lie should not be possible to be read off from the utterance or be encoded in the utterance. Hence, there just cannot be a speech act of lying!

This said, Ebert et al. (2014) do not have the same problem with CE in (72) that their approach has with (71). Given the assumption that there is a speech act operator ‘LIE’ in the consequent, it applies outright and is not restricted to the antecedent possibilities. And this is indeed in line with intuitions.

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A more in-depth argument is to be found in Biezma and Goebel (2019).

In the preceding paragraphs I have pointed out several problems for speech act accounts like the ones of Scheffler (2008) and, in particular, Ebert et al. (2014). First, deriving $ce$ in $bc$s from the semantic structure generates problems for cases where $ce$ does not arise. Second, positing multiple, non-standard speech acts is in many cases not intelligible and only an $ad$ $hoc$ strategy.

2.3.5 Generalizing the problem for speech act accounts

As we have seen in the previous paragraphs, the strategy of Ebert et al. (2014) to stipulate speech acts that do not have assertoric force to account for Siegel’s (2006) counterexamples to $ce$ fails quite badly as it makes their theory very obscure. It seems that none of these cases can be sufficiently analyzed in either of the recent semantic frameworks of Ebert et al. (2014) or Scheffler (2008). But even if these problematic cases from Siegel (2006) are put to one side as marginal cases, we encountered a general problem for semanticized speech act accounts, i.e. the problem of multiple logical forms. This became evident in the problem that the sentence in (71) can even have two $bc$ interpretations and that it is not clear within the semantic account how an interpreter chooses between these interpretations. Indeed, one could argue that we have a case of ambiguity and that context allows to choose one of the forms. But considering the conceptual problems of semantic accounts the question arises whether the detour via semantics is needed at all and whether one could not just give a pragmatic account.

The problem of multiple logical forms and thereby the problem of interpretational ambiguity generalizes for all semantic accounts, also for those that do not account for $ce$. Let’s take a step back. Scheffler (2008) and Ebert et al. (2014) claim that the difference between $hcs$ and $bcs$ is due to the semantics. Indeed, this is the claim of all speech act accounts of $bcs$ that are serious candidates for a compositional theory. Scheffler (2008) account admits two kinds of semantic, i.e. conventionalized, content, i.e.

\[27\] To be clear, the latter makes no claim about Siegel’s (2006) cases. But as it stands, applying Scheffler’s (2008) framework has the same explanatory shortcomings as Ebert et al. (2014).
truth-conditional and non-truth conditional. The latter is at the level of conventionalized implicature. On her account, \textit{if}-clauses in \textit{hcs} attach to and modify the truth-conditional content, \textit{bcs} modify the non-truth conditional content. Ebert et al. (2014) is in a way more unified, since \textit{hcs} as well as \textit{bcs} are explained via speech acts and their relations. In \textit{hcs} the referential speech act of the antecedent and the speech act in the consequent are integrated by binding, i.e. the consequent speech act is bound to the referential speech act. In \textit{bcs} the two acts are disintegrated. Hence, we have two different semantic structures or logical forms for \textit{hcs} and \textit{bcs}. As observed in the first section, \textit{if}-constructions are surface ambiguous, i.e. there is no conventional element that indicates whether we have the one or the other logical form. However, in some languages, e.g. German, there seems to be such an indication.

**Data from German is not sufficient for a semantic account** Ebert et al. (2014) and Scheffler (2008) as well as Krifka (2014) anchor their semantic accounts in data from German thereby countering the observation of surface ambiguity. At first sight, it seems that \textit{bcs} readings and \textit{hcs} readings in this language are grammatically distinguished by the syntactic position of the verb in the matrix clause. In \textit{bcs} the verb is standardly at the second position (V2) (76) whereas for \textit{hcs} it is at first position (V1) (77).

\begin{align*}
(76) & & \text{Wenn Du mich brauchst, ich bin den ganzen Tag zu Hause.} & \text{BC} \\
& & \text{(V2)} & \\
(77) & & \text{Wenn Du mich brauchst, bin ich den ganzen Tag zu Hause.} & \text{HC} \\
& & \text{(V1)} &
\end{align*}

This data is taken to be evidence that in German V1 \textit{if}-constructions inevitably receive an \textit{hc} interpretation and V2 \textit{if}-constructions are necessarily, i.e. by their semantics, interpreted as \textit{bcs}. Speech act accounts generalize this claim to a universal semantic claim. However, already Köpcke and Panther (1989) have argued that this claim does not hold in this assumed and predicted generality. This was taken up by Franke (2009) and further
elaborated in an experimental study by Csipak (2015). The latter was able to disprove the assumption that V1 and V2 have fixed interpretations. The examples (78) to (81) are V2 if-constructions which have \( \text{hc} \) readings just like the V1 forms in (a). The cases in (80) and (81) make the point very clear.

(78)  
  a. Wenn er das erfährt, gibt es Ärger.  
  b. Wenn er das erfährt, das gibt Ärger.

(79)  
  b. Wenn du auch nur in die Nähe, meines Autos kommst, ich spuck dir in deine Suppe.

(80)  
  a. Wenn du ihm davon erzählst, hau ich dir eine.  
  b. Wenn du ihm davon erzählst, ich hau dir eine.

(81)  
  b. Wenn du morgen nach Berlin fährst, ich komme mit.

The other direction is also possible, i.e. V1 with a biscuit interpretation as witnessed by (82).

(82)  
  a. Wenn du Hunger hast, da ist Pizza im Kühlschrank.  
  b. Wenn du Hunger hast, ist da Pizza im Kühlschrank.

Even though the interpretation of V2 in German if-constructions is a contested issue and a theoretical account of it is pending, the examples show that the assumption that the verb position determines which interpretation of an if-construction interpreters choose is rather implausible. There seem to be (strong) tendencies, but these are not enough for the stipulation of a difference in the semantics.

Even if it is granted that in German the difference between \( \text{hc} \) and \( \text{bc} \) interpretations is semanticized, languages like English (and probably French) definitely do not grammatically mark the difference between \( \text{hc} \) and \( \text{bc} \) readings. On the assumption that a semantic account of the dif-
ference between \( \text{hc} \)s and \( \text{bc} \)s is right, it owes an answer to the question of how interpreters choose between the logical forms in these languages. Even in German not all types of \( \text{bc} \)s can be marked by V1 or V2. The latter criterium can only apply to declaratives.\(^{28}\) \( \text{bc} \) questions in German, like (83), are not distinguished from their \( \text{hc} \) counterparts (84) by grammatical means.

(83) Wenn ich Hunger habe, ist Pizza im Kühlschrank?

(84) Wenn ich Hunger habe, bestellen wir eine Pizza?

Even if granted that German conditional questions and \( \text{if} \)-constructions in English are ambiguous by having two possible semantic representations, neither Ebert et al. (2014) nor any of the other semantic accounts gives an explanation of how interpreters disambiguate. Indeed, an additional pragmatic mechanism would be needed to establish disambiguation. Hence, these accounts are theoretically incomplete.

If – like Ebert et al. (2014) – additionally non-standard speech act operators are accepted, the problems only gets worse. Standard speech acts are those that are associated with the three sentence types where the latter are semantically encoded. Declaratives pattern with asserting, interrogatives with questioning and imperatives with commanding. Declarative \( \text{if} \)-constructions are ambiguous between \( \text{hc} \) readings and \( \text{bc} \) readings. But if a declarative can be additionally associated with other speech acts and even something like indirect speech acts, the possibilities for the semantic structure of only one \( \text{if} \)-construction explode. There will not only be two logical forms, but several that the interpreter has to decide upon. This got clear with example (71) where we can have an \( \text{hc} \) and two \( \text{bc} \) interpretations – a \( \text{bc} \) assertion and a \( \text{bc} \) command. At this point, the complexity of such an account makes it quite implausible.

\(^{28}\) This argument is also presented in Biezma and Goebel (2019).
2.3.6 Conclusion: Speech act theories need pragmatic mechanisms

In the sections above I have reviewed several problems for semantic speech act accounts of bcs. In particular, I have pointed out that these accounts have difficulties in explaining the data about ce that was presented in sections 2.2.2 and 2.2.3. Though some of these problems can perhaps be avoided by modifications, the most general issue is that semantic accounts in general cannot, on their own, explain when and why the ambiguous surface structure of an if-construction is interpreted as either an hc or a bc. Put differently, these frameworks cannot account for how an interpreter chooses between one interpretation or the other. Hence, an enrichment with particular pragmatic mechanisms is called for anyway.

It seems that most scholars of the semantic branch assume that the semantic difference they stipulate is enough for an interpreter to determine the relevant reading of an if-construction in context. But this is obviously not the case. This kind of criticism holds for both kinds of semantic accounts that I have distinguished: conditionalized speech act accounts and multiple speech act accounts. Conditionalized speech act accounts (Siegel (2006) and Krifka (2014)) lack an explanation of why ce arises for most bc interpretations. On the face of it, multiple speech act theories like the one of Ebert et al. (2014) seem to solve this problem at the cost of semanticizing ce. But with this move they run into problems with examples that show that ce is not hardwired, i.e. the counterexamples presented by Siegel (2006). These cases force Ebert et al. (2014) to adopt non-standard speech act operators into their theory. But this has serious unwelcome consequences. The adoption of non-standard speech acts, firstly, doesn’t sufficiently explain the counterexamples. Secondly, positing non-standard speech acts generates a plethora of possible logical forms for an if-construction, so that the problem of how an interpreter chooses one form even gets more pressing. In the end such an account has to rely on pragmatic mechanisms and contextual clues to determine which speech act (operator) is present in an actual utterance of an if-construction.
A very similar problem arises for Siegel (2006) and Krifka (2014). Though they constrain their accounts to speech acts that are indicated by sentence type, these accounts still have to heavily rely on pragmatic mechanisms to get to the predictions they are after. The pragmatic principle of relevance is central here and generates the particular (illocutionary) inferences and the discursive function of \( bcs \). However, neither of these accounts is specific about the notion of relevance, how additional inferences are derived and the overall pragmatic reasoning. Most importantly, with respect to this necessary pragmatic foundation, it is not clear how it meshes with the semantic structure given by speech act operators. This raises the question whether this additional semantic structure is justified at all.

A question that is neglected in the semantic speech act literature is what an \( hc \) reading consists in. Are \( hcs \) if-constructions that are incompatible with \( ce \)? Do \( hcs \) encode some kind of connection between antecedent and consequent semantically? Semantic accounts of \( bcs \) rely on an intuitive understanding of \( hcs \). The latter are characterized in the negative, i.e. all if-constructions that are not \( bcs \) are \( hcs \). But this is highly problematic considering the problem of characterizing and defining \( bc \) readings. It seems to be a tacit assumption of semantic speech act theories that standard semantics for if-constructions characterize \( hcs \). But this is clearly not the case for standard conditional semantics. Indeed, standard semantics for (indicative) if-constructions are compatible with \( ce \) by the logical principle that if the consequent is true, the entire if-construction also is true.\(^{29}\) Standard semantics for if-constructions explicitly resist to build something like a ‘connection’ between antecedent and antecedent into the semantics, hence it cannot be categorized as analyzing \( hcs \) exclusively. For a semantic account of \( bcs \) consequently there still is the question of what is at the core of the contrast between \( bcs \) and \( hcs \). Since semantic speech act accounts

\(^{29}\) For counterfactual if-constructions this principle is more contested, but still widely accepted.
start from the assumption that there is a semantic difference between bc
technical cues and hc
cues, one could claim that they are also theoretically obliged to give
an account of this difference and thereby tell what an hc interpretation
consists in. But to my knowledge this issue is not targeted in the literature.

But the most severe point is the following. Without calling upon prag-
matic mechanisms and contextual cues semantic speech act accounts can-
not explain the behaviour of bc, i.e. neither ce nor the performative flavor
and the relevance inference. This casts heavy doubt on whether the stip-
ulation of additional semantic structure does much or any work at all.
Admittedly, it is certainly not impossible to fill in some of the lacunakas in
semantic theories. My criticism was quite general and isolated points from
my arguments could be rebutted by going into the details of one theory or
the other. However, the general problems for semantic speech act accounts
pertain, because they are build into the conceptual foundations of these
approaches. An alternative way to go is to ask for a purely pragmatic
account for bc.

2.4 Outlook

Because 2.2.3 concluded that ce on its own is not enough to give a definition
of biscuithood, the preceding section 2.3 turned to a different perspective
from the performative flavor of bc. Speech act theories set out to explain
this latter feature. However, I have argued that these theories neither can
sufficiently explain the performative flavor nor can they account for ce. In
any case, they have to rely on independent pragmatic mechanisms that are
not spelled out within these accounts.

One of the main desiderata for a theory of bc that became obvious in
the discussion of speech act theories is to explain how interpreters come
to interpret an if-construction as either an hc or a bc. Surface structure
cannot provide sufficient triggers, even for languages like German. Hence,
interpreters will have to invoke, first, the content of the if-construction and,
second, contextual clues. The observation that one and the same surface
form can get an **bc** interpretation in stereotypical circumstances, but an **hc** interpretation in e.g. fictional contexts emphasizes this point. This also means that an account of **bcs** should be able to say something substantial about the difference between **hcs** and **bcs** by identifying the contextual feature that leads to a particular interpretation.

In the following chapters I sketch an account of **bcs** that is entirely pragmatic. First, I identify the contextual feature that is responsible for generating either a **bc** or an **hc** interpretation (chapter 3). Second, an independent pragmatic mechanism of enrichment then is responsible for generating the specific inferences that can be seen with **bcs** (chapter 4). However, this overall account turns to **ce** as a guiding criterion, again. Indeed, the contrast with unconditionals (2.2.3) showed that **ce** can have different sources. In unconditionals it is semantic. On my pragmatic take to be worked out in the next chapter, in **bcs** this source is contextual and does not necessarily lead to **ce**. With this the pragmatic picture is able to categorize Siegel’s (2006) examples as **bcs** and provides a big (though partly sketchy) and unified picture on how natural language users use, interpret, and process **if**-constructions.
Chapter 3

Biscuit conditionals and the notion of independence

3.1 The pragmatic approach: Rationale

Most $bc$s somehow ‘entail’ their consequent. Indeed, all of those $bc$s that are relatives of Austin’s (1956) example exhibit $ce$. I will call this class of examples paradigmatic $bc$s. From this perspective $ce$ is the central hallmark of $bc$s. Importantly, almost all of the ‘hard’ empirical features of $bc$s that were listed in chapter 2, e.g. the resistance to modus tollens, can be traced back to the property of $ce$. However, in the preceding chapter it was also established that there are cases which intuitively are $bc$s, but where $ce$ does not arise and, vice versa that there are if-constructions that exhibit $ce$ but cannot be categorized as $bc$s. How to proceed from this stalemate?

Semantic speech act theories start from the rather weak empirical criterium of a performative flavor of $bc$s. Additionally to the weakness of this criterium, the theoretical foundations of the employed theories of speech acts turned out to be rather blurred. The arguments against speech act accounts that were given in chapter 2 have shown that none of these accounts is generally successful and that none of them can explain the mentioned ‘hard’ empirical data including $ce$. 

53
Methodologically, then, I start from the hypothesis that, first, the interpretation of an *if*-construction as a *bc* is a pragmatic phenomenon and due to contextual features. Secondly, I regard the phenomenon of *cf* in *bcs* as a starting point and a guiding factor in identifying the contextual feature responsible for a *bc*-interpretation. The presumption is that by explaining why *cf* so often comes about in *bc* interpretations allows to put the finger on the essential aspect that is responsible for *bc*-interpretations in general.

There is a very strong argument that speaks in favor of this kind of pragmatic perspective. As discussed in the preceding chapter, the traditional, semantic camp ignores the fact that on hearing an *if*-construction the interpreter has to decide somehow whether it is intended as an *hc* or a *bc*. It was shown that though *bcs* seem to be marked e.g. in German, even in this language markedness is not generally the case (e.g. biscuit questions). Hence, it is a question of major importance what (contextual) information is accessible to the interpreter so that she can choose the right, intended reading.

A second observation speaking for the pragmatic approach is the possibility that changes to the context of utterance change the availability of readings - as *hc* or *bc* . This is to say that contextual factors are responsible for *cf*. An example in question is the utterance of a paradigmatic *bc* ‘If you are hungry, there are biscuits on the sideboard’ in a ‘Harry Potter context’ that involves magical or at least telekinetic abilities.

The major aspect is that the contextual feature in question has to be accessible to the interpreter. And furthermore, the speaker has to know that the interpreter has access to it. Hence, the contextual feature has to be mutually known or, in terms of Stalnaker (2014), it has to be common ground. This means that *cf* is derived by a pragmatic inference from the shared information. If *cf* is derived from a specific contextual feature by a pragmatic inference, there is also the prospect that counterexamples to *cf* in *bcs* can be explained by intervening contextual features that block or void the inference to *cf*.

1 This important and central fact is emphasized and brilliantly presented in Merin (2007).
A more general prospect of the suggested methodology is that it results in a better understanding of how interpreters come to the different interpretations of *if*-constructions as *hc* s and *bc* s. Identifying the contextual ingredients indeed helps to understand the heuristics that interpreters employ in arriving at a specific overall meaning for an *if*-construction, be it an *hc* reading or a *bc* reading.

### 3.2 Current pragmatic theories of *bc* s

A crucial part of the sketched pragmatic approach to *bc* s has been spelled out in recent years in a small number of papers: Francez (2015); Franke (2007, 2009); Lauer (2015); Merin (2007); Sano and Hara (2014). These accounts particularly focus on why *ce* arises and give a specific answer: *ce* is due to a contextual assumption of independence with respect to antecedent and consequent. This is surely a very intuitive characterization of why *ce* is central to a *bc* interpretation. When speakers are made aware that the utterance of a specific *bc* entails the unconditional truth of the consequent, they instantly come up with the explanation that this is natural since the truth of the consequent does not or cannot depend on the truth of the antecedent. With independence as a contextual feature a criterium is identified that is responsible for *ce* in *bc* s.

The theoretical task then is to spell out the notion of independence and to show how an assumption of independence can lead to *ce*. *Ce* from an assumption of independence also makes intelligible the difference to other consequent entailing *if*-constructions like unconditionals. For example, the communicative point of an unconditional is to *convey* independence. This means that the information given is that antecedent and consequent are independent in a certain way and this is derived from the semantics of the unconditional construction. In contrast, in *bc* s independence between antecedent and consequent is assumed by interpreter and speaker to

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2 Except for Merin’s (2007) original contribution, all other accounts, as well as the one presented here, build on Franke (2007, 2009).

3 See Rawlins (2013).
hold (disoursively) before the utterance of the *if*-construction. It is a Stalnakerian speaker presupposition as Lauer (2015) makes clear. A mutual assumption of independence by the discourse participants is a precondition for the bc reading to arise. If a speaker intends an *if*-construction to be interpreted as a bc, she has to take the assumption of independence to be common ground. Hence, independence is not the main point to be communicated with a bc. As a contextual assumption or presupposition the assumption of independence is (tacitly) made and not communicated.4

This aspect solves the problem of how interpreters identify whether an uttered *if*-construction is to be interpreted or intended to be interpreted as a bc or an hc. If the interpreter can assume that the speaker expects antecedent and consequent to be independent and furthermore expects that the interpreter makes the same assumption and each of them has access to these facts, a bc reading will arise. More briefly, if the interpreter takes it to be common knowledge or belief between her and the speaker that antecedent and consequent are independent, a respective *if*-construction is intended to be interpreted as a bc.

The idea that independence is the guiding contextual factor as well as formalizations of the notion of independence go back to Franke (2007) and Merin (2007). The former works within a qualitative framework and the latter spells out the notion of independence in a probabilistic, Bayesian setting. Independence in the intended sense is given when determining the (probabilistic or truth) value of the antecedent doesn’t settle the value of the consequent and *vice versa* relative to an information state. Importantly, on this picture, hcs and bcs do not differ in their semantics. However, the question regarding the function of the *if*-form in bcs (TQ2) and its formalization is rarely or insufficiently addressed by the pragmatic accounts that are on the market. I elaborate on this issue in chapter 4.

4 However, the assumption of independence is not a presupposition in the standard sense, because it is not triggered by linguistic means and hence also cannot be accommodated. Rather it is a contextual assumption about the shared (but tacit) world knowledge of the discourse participants.
The aim of the current chapter is to evaluate the notion of independence used by most pragmatic theories of BCS (Francez (2015); Franke (2007); Lauer (2015); Sano and Hara (2014)). Following Franke (2007), independence is modeled as a structural property of an information state relative to two or more propositions. As such, independence is related to what Yalcin (2011) calls a global property of or a condition on an information state. In the case of Franke’s (2007) notion of independence this pertains to compatibility between several propositions relative to an information state. Yalcin (2011) claims that such an ‘epistemic’ property – in particular the one he is interested for his analysis of ‘might’ – is not reducible to a condition on worlds and does not concern the way the world is. However, for the notion of independence at play in BCS I claim in this chapter that it springs from a condition on worlds and indeed that this is necessary to get things right with independence in BCS. Franke’s (2007) purely ‘epistemic’ perspective centered on a global property of information states falls short of this.\footnote{This criticism is also emphasized by Francez (2015) who coined the term ‘structural property’. However, Francez (2015) does not implement his criticism in his formal account.}

Franke (2007) calls his notion of independence epistemic independence. However, since the term ‘epistemic’ might be slightly misleading one should better use the label informational independence instead.\footnote{This point and the term is due to Cleo Condoravdi p.c.} As van Rooij (2007) has shown, Franke’s (2007) definition of informational independence is formally equivalent to Lewis’s (1988) notion of orthogonality of subject matters, where the formalization of a subject matter is a partition of a set of possible worlds. I will not go into the rather tedious enterprise of translating Franke’s (2007) framework into Lewis’s (1988). However, since I argue that the target notion of independence at play in BCS interpretations has to be spelled out differently, I use the term orthogonality as referring to Franke’s (2007) notion. In particular, I show that orthogonality does not on itself suffice to carve out the right notion of independence, but still plays a central role in deriving CE.
In the following I expound two arguments, one rather theoretical, the other empirical, that show that mere orthogonality is not enough and leads to wrong predictions with respect to bs. On the theoretical side, orthogonality cannot account for the fact that independence in bs is a stable and transcontextual constraint on conversational information states.\footnote{The term ‘transcontextual’ is taken from Merin (2007). It means that a condition applies to any contextual setting and is derived from general world knowledge. However, in Merin (2007), that probabilistic independence is a transcontextual constraint is an additional, external assumption by stipulation that is not represented in the formal framework, either.}

The empirical argument looks at the phenomenon of factual uses of if-constructions, where the truth of the antecedent is already mutually accepted by the discourse participants. In these cases, orthogonality gives no clue to distinguish between factual bs and factual hs.

The modified notion of independence that is presented in this chapter not only solves the problems for informational independence, but also makes up leeway for an explanation of when hs readings arise. Pragmatic accounts by now were not very explicit about what an hs reading consists in. Parallel to the fact that in bs assumptions about independence trigger the specific readings as pragmatic inferences, in the interpretation of hs purported causal and epistemic connections spring from assumptions about the possibilities of dependencies amongst the propositions at issue. Hence, hs interpretations, too, hinge on contextual features and are inferred, i.e. not part of the semantics. In the end, these inferences are the result of the quantificational semantics of if-constructions together with contextual assumptions from world knowledge with respect to dependencies between propositions.

I amend Franke’s (2007) notion of independence and his derivation of ce with a representation of factual dependencies in the framework of Veltman (2005). It was claimed for independent reasons that this kind of machinery is needed for the interpretation of counterfactual if-constructions (Kratzer, 1989; Veltman, 2005) and deontic modals like should (Arregui, 2011). This apparatus gives the tools to derive informational independence from discourse participants’ knowledge of dependencies between facts. The de-
dependencies are properties of worlds, i.e. rather metaphysical/ontological than epistemological. In bc readings informational independence on the modified framework is derived from assumptions about ‘metaphysical’ independence. With this, consequent entailment (cE) will be viewed as a contextual inference due to pragmatic pressure to retrieve a coherent Common Ground (CG).

In section 3.3 I review Franke’s (2007) account of independence and cE. In section 3.3.1 I discuss the conceptual shortcomings of orthogonality and why factual uses of if-constructions pose a problem for the unamended account. I introduce the relevant elements of Veltman’s (2005) framework for representing factual dependencies in section 3.4 and carve out the notion of ‘metaphysical’ independence, i.e. factual independence, following from it. In section 3.4.4 this notion is implemented into a common ground model of communication. I show how the notion of factual independence and Franke’s (2009) informational independence work together in the derivation of cE in bcs (section 3.5).

3.3 The Franke-Lauer account of independence and cE

In Franke (2007, 2009) independence of propositions \( [\phi] \) and \( [\psi] \) for a bc \( \phi > \psi \) is intuitively understood in the sense of the truth of the consequent not depending on the truth of the antecedent and vice versa. In particular, Franke (2009) relativizes this idea to an information state of an agent. An assumption of independence between two propositions shows up in the disposition of an agent that on the occasion of learning or supposing one

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8 I use single quotation marks, because ‘metaphysical’ here is just meant to refer to the fact that independence between facts is conceptualized as a property of possible worlds and not a thick philosophical concept.

9 I use lowercase greek letters \( \phi, \psi, \ldots \) for formulas (sentences), lowercase arabic letters for atomic sentences \( p, q, \ldots \) and uppercase arabic letters for propositions \( P, Q, \ldots \) and denotational brackets \( [ \ldots ] \) to refer to propositional denotations. > is an if-construction-forming device. (For sentences forming an if-construction one might want to exclude disjunctions, because of their difficult behaviour within if-constructions in general.)
of the propositions ceteris paribus, i.e. not learning or supposing anything else, the agent does not change the value or evaluation of the other proposition. This means that supposing that one proposition is true or false does not lead to any assumption about the truth or falsity of the other proposition.\(^\text{10}\) The basic informal idea is that two propositions are independent with respect to an information state iff learning the truth-value of one of the propositions is not enough to determine the truth-value of the other proposition. Independence is thereby spelled out with respect to how agents tend to change their beliefs. Since independence is defined relative to an information state, it is a doxastic or epistemic notion and encodes a global property of an information state.

Franke formalizes informational independence of propositions adopting Lewis’s 1988 notion of orthogonality of subject matters as in (85). For Franke, orthogonality as informational independence is the crucial notion at play in bc interpretations. However, in section 3.3.2 I argue that for a sufficient explication of the notion of independence additional assumptions are necessary.

\[\text{(85)}\quad \text{Let } \llbracket \phi \rrbracket \text{ and } \llbracket \psi \rrbracket \text{ be propositions, i.e. sets of possible worlds, } X \text{ and } Y \text{ variables over propositions and } \sigma \text{ an information state, i.e. also a set of possible worlds.}
\]

Propositions \( \llbracket \phi \rrbracket \) and \( \llbracket \psi \rrbracket \) are orthogonal iff
\[\forall X \in \{ \llbracket \phi \rrbracket, \llbracket \phi \rrbracket \}, \forall Y \in \{ \llbracket \psi \rrbracket, \llbracket \psi \rrbracket \} : \text{if } \Diamond_\sigma X \text{ and } \Diamond_\sigma Y \text{ then } \Diamond_\sigma (X \cap Y)\]
where \( \Diamond_\sigma P \) is shorthand for \( P \cap \sigma \neq \emptyset \), i.e. compatibility of \( P \) and the information state \( \sigma \).\(^\text{11}\)

\(^{10}\) I here rather incorrectly talk about propositions being true. A proposition \( P \) holds at a world or is true at a world \( w \) iff \( w \in P \).

\(^{11}\) I.e. we have to conceive of \( \Diamond \) and \( \Box \) as something like meta-modals. Thanks to Antje Rumberg for pointing this out.
What definition (85) requires is that all possible intersections of the propositions and their respective complements have to be compatible with the information state $\sigma$. Hence, independence is defined in terms of a complex set of compatibilities. Note, that the definition is conditional on the assumption that each proposition and its complement are possible with respect to the information state in question. In particular, the definition gives four conditions on an information state to satisfy orthogonality:

1. If $\Diamond \llbracket \phi \rrbracket$ and $\Diamond \llbracket \psi \rrbracket$, then $\Diamond (\llbracket \phi \rrbracket \cap \llbracket \psi \rrbracket)$
2. If $\Diamond \llbracket \phi \rrbracket$ and $\Box \llbracket \psi \rrbracket$, then $\Diamond (\llbracket \phi \rrbracket \cap \llbracket \psi \rrbracket)$
3. If $\Box \llbracket \phi \rrbracket$ and $\Diamond \llbracket \psi \rrbracket$, then $\Diamond (\llbracket \phi \rrbracket \cap \llbracket \psi \rrbracket)$
4. If $\Box \llbracket \phi \rrbracket$ and $\Box \llbracket \psi \rrbracket$, then $\Diamond (\llbracket \phi \rrbracket \cap \llbracket \psi \rrbracket)$

Each condition presents a material implication. (85) is non-trivially satisfied by an information state, if each antecedent and each consequent of the conditions are true. However, the definition can also be satisfied if one of the propositions or its complement, e.g. $\llbracket \phi \rrbracket$, is true throughout the information state ($\Box, P$ for $\sigma \subseteq P$) and the material implications are made true by this. That means that if we have a $\Box$-case for at least one of the propositions or its complements, this proposition is rendered orthogonal or respectively independent of any other proposition in $\sigma$. I will term this property the box property of (85). It plays a key role in Franke’s (2007) and Lauer’s (2015) account of deriving consequent entailment in $bc$-s.

12 In the following I will dispense with indexing diamonds with $\sigma$ when I take it to be obvious w.r.t. which state compatibility is evaluated.

13 By case-by-case reasoning: If $\Box \llbracket \phi \rrbracket$ holds, (85) is satisfied, because $\Diamond \llbracket \phi \rrbracket$ is false with respect to $\sigma$, whereby the antecedents of (3) and (4) are false. So, conditions (3) and (4) as a whole are rendered true. For conditions (1) and (2) we have to discriminate three cases: first, $\llbracket \psi \rrbracket$ and $\llbracket \bar{\psi} \rrbracket$ are both compatible with $\sigma$, i.e. there are $\llbracket \psi \rrbracket$- and $\llbracket \bar{\psi} \rrbracket$-worlds. Additionally we have $\Box \llbracket \phi \rrbracket$ implying $\Diamond \llbracket \phi \rrbracket$. Thereby (1) and (2) are true (antecedent and consequent are true). Second, if $\llbracket \psi \rrbracket$ is true throughout $\sigma$, i.e. $\Box \llbracket \psi \rrbracket$. The antecedent of (2) is false and condition (2) is true. $\Box \llbracket \psi \rrbracket$ implies $\Diamond \llbracket \psi \rrbracket$, hence (1) is true. Third, if $\llbracket \bar{\psi} \rrbracket$ is false with respect to $\sigma$, i.e. $\Box \llbracket \bar{\psi} \rrbracket$, the antecedent of (1) is false and condition (1) is true. Whereas, $\Box \llbracket \bar{\psi} \rrbracket$ implies $\Diamond \llbracket \bar{\psi} \rrbracket$ and condition (2) is true.
Consider the following example: Assume Jackie is not informed about whether Alfonso is hungry (⟦φ⟧) or not (⟦¬φ⟧). The representation of Jackie’s information state as a set of possible worlds then comprises worlds where Alfonso is hungry and worlds where he is not hungry. Similarly, Jackie is not opinionated on the proposition that there are biscuits on her kitchen table (⟦ψ⟧). Furthermore, Jackie does not believe that the truth of one of the propositions influences the truth of the other, hence on learning that Alfonso is hungry, she will not adopt a belief about there being biscuits on her kitchen table. This feature is also represented by her information state as a set possible worlds in the following way: there is at least one world for each combination of truth values. I.e. she believes each of the possible combinations of the propositions to be possible: there is a world where Alfonso is hungry and there are biscuits, where he is hungry and there are none, where he is not hungry and there are biscuits and where he is not hungry and there are no biscuits. All of these are possible candidates for the actual world from the doxastic perspective of Jackie. Indeed, this is what is expressed formally by (85). However, this example does not consider a state, where one of the propositions is already taken to be true. Such states come in in the derivation of ce.

For modeling the process of interpretation towards ce in bcs I follow the exposition in Lauer (2015). In this setting, an interpreter Int reasons about what the information state σ_S of the speaker S of an if-construction looks like. Because of this Lauer (2015) is a reconstruction of the metareasoning about the speaker’s state an interpreter goes through. Int’s hypotheses about σ_S are modeled as a set of information states Σ_{σ_S} whose elements are candidates for being the actual state σ_S of the speaker from the perspective of Int. If the speaker utters a sentence with a certain overall meaning in context this is regarded as evidence about the properties of her information state (assuming truthfulness). Put differently, utterances of the speaker bring up further constraints on the representation of the speaker’s state Σ_{σ_S} which is updated by eliminating states that do not satisfy these constraints.

14 My exposition abstracts from some complexities of Lauer’s (2015) account. For the comprehensive picture the reader is referred to the original paper.
Int starts the interpretation of an if-construction as a $\text{bc } \phi > \psi$ with the assumption that $\sigma_S$ satisfies informational independence (in the sense of definition (85)) with respect to $\phi$ and $\psi$. Hence, $\Sigma_{\sigma_S}$ also includes information states that satisfy (85) because of $\Box\llbracket\phi\rrbracket$, $\Box\llbracket\psi\rrbracket$, $\Box\llbracket\phi\rrbracket$ or $\Box\llbracket\psi\rrbracket$. On the assumption that the speaker truthfully utters the conditional $\phi > \psi$ the interpreter Int learns about $\sigma_S$ that additionally to (85) it also satisfies (86-a) and (86-b).

\[(86)\]
\[
\begin{align*}
a. \quad & \neg\Box(\llbracket\phi\rrbracket \cap \llbracket\psi\rrbracket) \\
b. \quad & \Diamond\llbracket\phi\rrbracket \text{ (linguistic presupposition of the antecedent)}
\end{align*}
\]

These constraints on the information state of the speaker are encoded in the semantics of the if-construction and its linguistic presuppositions. Int now has to single out the information states that satisfy all constraints, i.e. pick from the states that satisfy (85) those that also satisfy (86-a) and (86-b). If (86-a) has to be satisfied by $\sigma$, the consequent of (2) has to be false. To uphold (85), the antecedent of (2) must not be true, otherwise condition (2) as a whole would be false. $\Diamond\llbracket\phi\rrbracket$ also has to be true because of (86-b). Hence, $\Diamond\llbracket\psi\rrbracket$ has to be false, i.e. $\Box\llbracket\psi\rrbracket$ is true. The falsity of $\Diamond\llbracket\psi\rrbracket$ is taken over to condition (4) and makes the antecedent false, hence (4) is true.

This means that the only information state that satisfies informational independence as given by (85) and the two constraints from the conventional meaning of the conditional $\phi > \psi$, i.e. (86-a) and (86-b), is one where the consequent $\psi$ is true throughout the whole information state $\sigma$, i.e. $\Box_{\sigma}\llbracket\psi\rrbracket$. In order to satisfy all constraints the interpreter’s model of the speaker $\Sigma_{\sigma_S}$ will only comprise states where the consequent $\psi$ is taken to be true. All other states get eliminated. Thereby the interaction of the assumption of independence and the semantic constraints from the if-construction give cease as a contextual inference to the effect that $\sigma_S \subseteq \llbracket\psi\rrbracket$.

15 Another way of framing this without the truthfulness assumption is that Int reasons about the states that S publicly promotes and thereby publicly commits to. For further discussion see Lauer (2013, 2015).

16 This presupposition holds for the indicative case, but it carries over to the counterfactual case where the if-construction is evaluated w.r.t. a revised state where the antecedent is true, see e.g. Veltman (2005).
3.3.1 Shortcomings of informational independence

Even though the Franke-Lauer account elegantly derives a bc in a pragmatic way, in this section I point out some problems and shortcomings that motivate the modified framework that I suggest in section 3.4.

Francez’s (2015) counterexample and its putative solution

Francez (2015) puts forward a type of scenario that is problematic for the Franke-Lauer account. However, as I will argue below, Francez’s (2015) own solution does not solve the problem, so that a different take is needed.

The counterexample involves a situation where the addressee of an utterance of $\phi > \psi$ knows that on the speaker’s information state $⟦\phi⟧$ and $⟦\psi⟧$ are informationally independent. But still the if-construction is interpreted as an hc. On the assumption that on Franke’s (2007) account informational independence relative to the speaker’s information state is definitional for a bc reading, Francez (2015) claims that this makes the wrong prediction for the scenario at hand since intuitively an hc reading is given.

Crucially, Francez’s (2015) case relies on the box property of informational independence, i.e. if one of the propositions is settled w.r.t. the information state of the speaker, this proposition is independent of every other proposition in the information state and the other way around. That the addressee assumes independence in Francez’s (2015) counterexamples is a consequence of her assumption that the speaker knows or believes the antecedent (hence $\Box_3 P$).

Here is Francez’s (2015) scenario:

“[..] consider the scenario of a child playing a game with an adult. The game involves a box with holes of different colors and balls matching the colors of the holes. The child is supposed to put each ball into the hole that matches its color. The parent knows that, if the child correctly matches the colors, the ball reappears in a slot after a few seconds, and if not, it
stays trapped inside a tube and must be released. The child however does not know this, since she has not played this game before. The child proceeds to take a ball and put it in one of the holes. Suppose the child is perfectly aware that the adult knows whether her choice was right or not, and she is also aware that the adult knows the outcome of a correct and an incorrect choice. The adult says:

If you made the right choice, the ball will come out here.”

[p. 16]

Because the child assumes that the adult knows whether the antecedent of the uttered if-construction is true or not, via (85) and the resulting box property, it also has to assume that the antecedent is informationally independent of the consequent on the adult’s information state. Hence, the Franke-Lauer account predicts a \(bc\) reading for the if-construction. But, it is very clear that the conditional receives an \(hc\) reading. What is conveyed is that whether the ball comes out is dependent on making the right choice according to the rules of the game.

Though the example is instructive, Francez (2015) makes a wrong diagnosis of the source of the problem. It is claimed that what the Franke-Lauer account gets wrong is which state the addressee reasons about. Francez (2015) argues that it is not the speaker’s private epistemic or doxastic state, but the common ground, i.e. the information taken for granted in the conversation that is at issue here. If the example is framed in this way, the putative counterexample is to vanish.

“[B]iscuit readings do not arise from independence of the relevant issues on the speaker’s epistemic state, but instead from dependence of the issues in the common ground being ruled out by mutual knowledge about causali [sic!] and epistemic dependencies. What happens in the game scenario just described is simply that, even though the antecedent and consequent are independent for the parent, and even though this
is known to the child, there is no common ground information ruling out dependence. When the parent utters the conditional, there is thus no reason for the child not to interpret it as expressing a condition.” [p. 17]

What this seems to mean is that though the child assumes that antecedent and consequent are independent on the parent’s information state, and that it is common ground that it assumes this, it is not common ground that they are independent in the common ground *per se*. Why is this? Because the child does not take over from the parent or shares the property of independence on her information state and, hence, it is not shared common ground information.

But the shift to reasoning about the common ground does not solve the problem. Consider the parent’s utterance of (87) in the same situation instead.

(87) If you made the right choice, there are biscuits on the sideboard.

The most plausible interpretation of (87) is as a *bc* that conveys that as a reward for figuring out the right choice it is allowed to take a biscuit from the sideboard. Again, the child has strong reasons to assume that the parent knows whether it made the right choice or not. Put differently, the parent knows the truth-value of the antecedent and, hence, antecedent and consequent are independent. But this time, it seems, the child takes over the property of informational independence from the parent’s information state since it arrives at the intended *bc* reading. Hence, informational independence is common ground, in particular, it is a structural property of the context set.

But this take on reasoning about independence in *bcs* is clearly wrong and does not conform with natural language speakers intuitions. In particular, Francez’s (2015) putative solution in terms of common ground just cannot explain why in the biscuit interpretation (87) independence is common ground and why it is not in the utterance of the *if*-construction in Francez’s (2015) original example.
The right diagnosis of the problem is quite obvious. For the $\text{bc}$ interpretation of (87), that the parent knows that the antecedent is true is – on the intuitive understanding of the notion of independence – certainly not the reason why the propositions are taken to be independent. Indeed, for Francez’s (2015) original example it is certainly not in line with intuitions to call antecedent and consequent independent in the parent’s information state at all. Just because somebody knows that one of the propositions is true doesn’t suffice that the contents in question are intuitively independent in the intended sense. Hence, the examples rather show that orthogonality does not carve out the notion of independence at play in $\text{bc}$ interpretations in the right way.

Furthermore, Francez’s (2015) suggestion that what the interpreter reasons about is the common ground is perfectly compatible with and indeed implemented in Lauer’s (2015) formal elaboration of $\text{bc}$ reasoning. What the addressee reasons about can be very plausibly conceived of as the speaker presuppositions (in the sense of Stalnaker (2014)) of the utterer. Speaker presupposition is the information that the speaker takes to be the shared background in a communicative exchange. What $\Sigma_s$ represents is then presuppositional states that are compatible with what the speaker explicitly presupposes via her utterances. If independence is taken to be a speaker presupposition by the addressee, the reasoning towards $\text{ce}$ is triggered. However, the general problem about the box property from Francez’s (2015) example still remains central as shown in the next section.

**Factual conditionals as an empirical problem for informational independence**

In this section I show that in fact the putative shift to the common ground cannot solve the problem for orthogonality as a formal explicatum of the intuitive notion of independence (85). This problem is that for certain cases – those in which orthogonality is satisfied by the antecedent being established with respect to the relevant information state – Franke’s (2009) account wrongly predicts $\text{bc}$ readings, if informational indepen-
dence is taken to be definitional for bcs.\textsuperscript{17} Indeed, there are utterances of if-constructions where the antecedent is established in the common ground already and where orthogonality would predict bc readings generally. But on the contrary, many of these if-constructions are interpreted as hcs.

Following Constant (2014) the latter uses of if-constructions are called \textit{factual conditionals}.\textsuperscript{18} As said, for factual conditionals the antecedent is mutually presupposed by the discourse participants. In Stalnakerian terms (Stalnaker, 2014) the antecedent is common ground, i.e. it is among the propositions mutually taken for granted for the purpose of the conversation and true throughout the context set cs (the intersection of all the propositions that are common ground). The cs represents the relevant information state for the interpretation of the if-construction. This means that for a bc interpretation the cs is subject to the independence assumption.

The crucial point for current purposes about factual uses of if-constructions is that they can come as bcs (88) or as hcs (89), (90).

(88) A: I am starving!

\textsuperscript{17} Indeed, Franke (2009) does not claim it to be definitional. However, the aim of this chapter is to turn independence into such a criterion. Furthermore, it seems that most scholars who criticize the independence account of bcs (e.g. Eric Swanson) take it that informational independence is taken to be a definitional criterium.

\textsuperscript{18} Like hcs and bcs, factual conditionals are not a kind of conditionals in the sense of having a special semantics. Rather, they are particular uses of if-constructions. Iatridou (1991) coined the term 'factual conditionals' for uses that carry the presupposition that somebody other than the speaker takes the antecedent to be true. I divert from this definition and assume following Constant (2014) that there are factual conditionals where the antecedent is actually taken to be Common Ground. A similar phenomenon was observed early on in Akatsuka (1986) (i).

(i) (A mother and her son are waiting for the bus on a wintry day. The son is trembling in the cold wind.)
Son: Mommy, I’m so cold.
Mother: Poor thing! Of course you are. If you’re so cold, put on my shawl.

However, the consequent of the if-construction uttered by the mother is an imperative and thereby, following Biezma and Goebel (2019), not subject to the hcs - bc distinction. A further difference to Iatridou (1991) is that I do not assume that factual conditionals have a special logical form different from standard if-constructions.
B: Sure you are. You’ve been traveling all day. If you are (so) hungry, there are sandwiches in the fridge.

(89) A: I am starving!
B: If you are so hungry, I’ll make you some sandwiches.

(90) A: I am so cold.
B: Yes, you don’t look well. If you are cold, you probably have the flu.

Franke (2009) explicitly notes that there are factual hypothetical conditionals, which he calls echoic conditionals.\footnote{However, his examples are not clear-cut, since they involve effects like the ones in Iatridou (1991), e.g. contesting the truth of the antecedent.} He argues that though factual conditionals give rise to $ce$, they are not $bc$s, since the source of $ce$ is different: In factual conditionals $ce$ is due to the fact that the restriction to antecedent worlds is already in place, i.e. the antecedent is CG. Consequent entailment then follows by something one can call *modus ponens*-reasoning. However, Franke (2009) seems not to be aware, that factual uses are still a problem for his notion of independence (85). Importantly, for a factual use of $\phi > \psi$ it was established beforehand that $\square\llbracket\phi\rrbracket$ holds with respect to the $cs$. And hence antecedent and consequent are informationally independent whether we observe a $bc$ reading or not. But then it is curious how interpreters can make the difference between factual hypothetical and factual biscuit conditionals.

Indeed, Franke’s (2007) notion of independence is satisfied in (88) and therefore predicts the *if*-construction to be a $bc$. But it wrongly predicts (89) to be a $bc$ where it clearly receives a hypothetical interpretation conveying a dependence between antecedent and consequent. This is due to the fact that for both, (88) and (89), orthogonality holds because of $\square\llbracket\phi\rrbracket$ w.r.t. the context set. Admittedly, we have something like $ce$ for (88) and (89), because in each case the addressee learns that the consequent is true.
However, this is due to *modus ponens* (MP) reasoning and doesn’t arise from reasoning about (in)dependence. MP reasoning is different since it is not inferred that the consequent is true *regardless* of the truth of the antecedent. The latter is only inferred in (88).

A criterium for making the difference between (89) and (88) is that the hypothetical version can give rise to the additional counterfactual implication that if the addressee was not hungry, the speaker wouldn’t prepare sandwiches. Or, at least that there is the possibility that the speaker doesn’t prepare the sandwiches: if the addressee was not hungry, the speaker might or might not prepare sandwiches. This implication is not even possible in (88) because antecedent and consequent are independent, i.e. the sandwiches are prepared in any (contextually salient) case. However, Franke’s (2007) notion of independence as mere orthogonality cannot account for this difference.

Again, the problem is that orthogonality is satisfied when one of the involved propositions $P$ is established with respect to the relevant information state (here, $cs \subseteq P$). Independence in the sense of (85) is then satisfied between $P$ and all other propositions in the information state. But especially from the factual uses in (88) and (89) we can conclude that the notion of independence being relevant here is more specific and fine-grained, i.e. independence between the particular antecedent and the particular consequent proposition. Orthogonality cannot provide us with a criterium for making a difference between a factual $hc$ and a factual $bc$, because in each of these cases independence as defined in (85) is satisfied. However, intuitively, speakers still identify the factual $bc$ on grounds of an intuitive notion of independence: The truth of the antecedent does not influence the truth of the consequent, i.e. the latter does not depend on the former. Hence, informational independence in the sense of (85) does not carve out the right notion of independence. In $\Box$-cases, independence is predicted for the *wrong reasons*. The problem is also due to the fact that Franke (2009) does not use independence directly as an identifying criterium for biscuit-hood, but rather as a tool for deriving $ce$. But as we have seen with several
examples in chapter 2, bcs do not necessarily involve CE. However, for all bcs cases intuitively it is right to claim that antecedent and consequent are independent. It is then the task to carve out this intuitive notion of independence formally and, simultaneously, to keep Franke’s and Lauer’s insights about how CE is derived.

If we think about the reasoning process towards CE suggested by Lauer (2015), and in particular the information state after deriving CE, we arrive at another perspective on the problem. Intuitively, we can describe the reasoning towards CE as reasoning to uphold or maintain independence between antecedent and consequent proposition in the representation of the speaker’s information state. But with arriving at the state where the consequent is true across the board, the information about the particular independence between antecedent proposition and consequent proposition is no longer recoverable. The consequent proposition is independent of any other proposition in the state and not just from the antecedent proposition. It has the same relation to the antecedent proposition as any other accepted proposition.

The desideratum for a formal representation is to make the information about independence retrievable even after one or both of the propositions in question are established in the information state. This means to store this information independently of the specific updates to the information state in question. Merin (2007) coined the term that independence has to be a transcontextual constraint that is stable with respect to (monotonic) updates.

### 3.3.2 Preserving informational independence

The need for modeling independence in this way is underlined by a further point about orthogonality. Orthogonality is, in a way, ambiguous, i.e. it allows to apply to two kinds of information states. If we take an information state that non-trivially (i.e. no box case (□)) satisfies (85) and

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20 But, as I argue, all bcs involve independence, e.g. also Siegel’s (2006) cases like ‘If they ask you how old you are, you are four.’. Also in this example antecedent and consequent are independent.

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we stipulate that (85) is a transcontextual constraint, $c_e$ will arise upon an utterance of an according if-construction. But, without the stipulation of transcontextuality, orthogonality is also satisfied by an information state that represents an agent who is ignorant about a relation between the propositions in question. Recently this point against (85) was brought forward by Mandelkern and Rothschild (2018).\(^{21}\) They give the following example (p. 8): An agent ponders two possibilities, whether Bill goes to the party and whether Sue goes to the party. She has no idea whether either is true or not and furthermore does not know of any dependence between the two propositions. Hence, the distribution of worlds that make up the information state of the agent is such that orthogonality (85) is satisfied. I.e. there is at least a world where Bill goes to the party and Sue goes to the party, a world where Bill does not go to the party but Sue goes, a world where Bill goes but Sue does not go and finally a world where neither Sue nor Bill go to the party. Following (85) the propositions are independent. However, our agent then learns that Bill and Sue are dating and that they go everywhere together. Now, the agent will not leave it open that one goes to the party while the other does not. On the contrary, she will take this to be false. Similarly, she might receive the information in form of an utterance of an if-construction that if Bill goes to the party, Sue does so, too. In this case, the agent will learn about a dependence and certainly not strive to uphold orthogonality by inferring $c_e$. What is not encoded in Franke’s (2009) model is when an agent should preserve orthogonality and when she should give it up. Mandelkern and Rothschild (2018) argue that orthogonality standardly is not preserved when updating with conditional information, i.e. updating with conditional information does not respect informational independence. However, where in the Sue-and-Bill case the agent obviously has no reason to uphold informational independence, for a $bc$ interpretation she has. But what is that reason? Well, that the truth

\(^{21}\) However, the discussion in their paper focusses on presupposition projection in if-constructions where the very same notion of independence and the same mechanism towards $c_e$ can be used. See van Rooij (2007). Mandelkern and Rothschild’s (2018) criticism holds independently of the linguistic phenomenon but focusses on the conceptual underpinnings of the notion of independence.
of one of the propositions does not determine the truth of the other proposition. But here we get into a circle, because exactly this was what the notion of orthogonality was to capture. Here again, the desideratum is to establish independence as a stable and transcontextual constraint on the information state. And this cannot be done with mere orthogonality.

This amounts to two arguments against informational independence or orthogonality as the *explicatum* of independence in *bc*s. First, there is the circularity with respect to why informational independence has to be maintained. Second, (instable) informational independence is phenomenological inadequate for accounting for *bc* readings. The latter is shown with the example from Mandelkern and Rothschild (2018) and with factual uses of *if*-constructions.

The ambiguity problem – that orthogonality can also encode ignorance regarding a relation of (in)dependence – also shows up at another point in Lauer’s (2015) reconstruction. Within this model it does not seem to be possible that a speaker is genuinely ignorant or undecided about a dependence between two propositions. The only way to model an agent with $\Sigma_S$ who is undecided w.r.t. a dependence between propositions in question is by having a set of at least two information states, i.e. one where the propositions are orthogonal (independent) and one where the propositions are non-orthogonal (dependent). However, this rather encodes uncertainty on part of the interpreter about which state is the actual information state of the interpreted agent. The idealized aim of the interpretational model in Lauer (2015) is to single out the actual state of the speaker. But what if he is genuinely undecided on a relation of dependence between two salient propositions? Considering such a state, similarly to what Mandelkern and Rothschild (2018) argue, it would satisfy (85) since for every possible combination of truth-values of the propositions in question there would be at least one world in the state.

Francez (2015) rightly states that orthogonality as spelled out by (85) is merely a *structural property* of an information state. I take that to mean that orthogonality depends only on the distribution of worlds amongst the information state as a set of possible worlds. It merely looks at whether
each of a pair of propositions holds or does not hold at a world. This structural property is ambiguous between being interpreted as independence or ignorance about a dependence. The difference is that in the case of the independence assumption at play in a \( \Box \) interpretation, (85) is a stable property of the information state, whereas for ignorance the state is ready to lose this structural property if a dependence is learned. Yet, this feature is not encoded by orthogonality itself.

The problem of ambiguity then gives rise to the same desiderata that resulted from the box cases (\( \Box \)). The notion of independence arises from and has to be stored more or less independently of the structural property. This would allow to have it as a stable and transcontextual constraint. The account of independence that I suggest in the next section is based on two hints that are given by Francez (2015) and Franke (2009). The former claims that

“it is not enough that the issues happen in fact to be [informationally] independent in the common ground. Dependence must be incompatible with mutual knowledge.” [p. 18]

In particular, independence is given when

“dependence of the issues in the common ground [are] ruled out by mutual knowledge about causal and epistemic dependencies.” [p. 17] (emphasis added)

This is more or less equivalent to require that independence is a stable constraint on the common ground and makes explicit that we have to take into account what discourse participants know about causal (and epistemic) dependencies.

Given cases of counterfactual \( \Box \)cs from chapter 2 repeated below as (91) Franke (2009) offers a counterfactual version of informational independence (85).

(91) If you had been hungry, there would have been pizza in the fridge. (Franke 2009: 270)
Franke (2009) conceives of counterfactual if-constructions as sensitive on an ordering of worlds in a modal structure \( \langle R_w, \preceq_w \rangle \), where \( R_w \subseteq W \) and \( \preceq_w \) is an ordering on \( R_w \). Furthermore, a minimality function \( \text{Min}_w(X) \) selects the minimal worlds from the ordering where the antecedent is true. Intuitively, these are the worlds where only minimal changes are made with respect to the actual world to make the antecedent true. Structurally this is equivalent to the Lewis-Stalnaker approach to counterfactuals, where worlds are ordered via a similarity relation that gives rise to an ordering into spheres around the actual world.\(^{22}\)

In this modified notion of informational independence \( \phi \) and \( \psi \) are conditionally independent for an agent if a minimal change in the belief about \( \phi \) will not result in a change in the belief about \( \psi \), and vice versa. The formal representation is as in (92).

\[
\text{(92)} \quad \text{Relative to a modal structure } \langle R_w, \preceq_w \rangle \text{ } \phi \text{ and } \psi \text{ are informationally independent iff}
\]

\[
\forall X \in \{\llbracket \phi \rrbracket, \llbracket \phi^c \rrbracket\}, \forall Y \in \{\llbracket \psi \rrbracket, \llbracket \psi^c \rrbracket\} : \diamond Y \text{ iff } X \Diamond \Rightarrow Y
\]

where for all \( X, Y \subseteq W : \diamond Y \text{ iff } \text{Min}_w(Y) \cap Y \neq \emptyset \) and \( X \Diamond \Rightarrow Y \text{ iff } \text{Min}_w(X) \cap Y \neq \emptyset \);

\( \text{Min}_w(X) \) are all the \( \preceq_w \)-minimal worlds in which either \( \phi \) or \( \neg \phi \) holds

For the interpretation of a counterfactual if-construction \( \phi \gg \psi \) this means that we look at those worlds where either the antecedent or its complement are minimally true and evaluate whether this changes something about the truth value of the consequent. From this perspective learning the antecedent did not change anything about the agents belief in the consequent.

\(^{22}\) However, we should keep in mind that Franke’s (2009) approach is about epistemic states. Hence, the modal structure rather represents a structure for belief revision, or, fallback options (in the sense of Segerberg (2006)). Indeed, it was shown in Grove (1988) that belief revision and the sphere model for counterfactuals are equivalent.
This definition is useful for subjunctive bs since standardly for a subjunctive if-construction the antecedent is known to be false. The modal structure interpreted in terms of similarity gives a set of worlds that is most similar to what the agent takes to be the case in the actual world, but without the falsehood of the antecedent. I.e. the modal structure determines an ‘alternative’ information state with respect to which the conditional claim is evaluated. The steps involved in this procedure are, first, to make room for the truth of the antecedent via belief revision that is guided by the modal structure. Second, if orthogonality is satisfied in this revised state \( \sigma_r \), a bc reading of an if-construction is predicted.

Franke (2009) notes that the definition of independence given in (92) not only helps with counterfactual bs, but also with overcoming the box problem.

“Remember that according to [(85)], if an agent has a fixed belief in a proposition \( A \), i.e., if \( \Box A \) or \( \Box \neg A \) is true on information state \( \sigma \), then any proposition \( C \) is conditionally independent of \( A \) on \( \sigma \) in the sense of [(85)]. The notion in [(92)], on the other hand, allows such ‘circumstantial beliefs’ not to interfere with the definition of independence, because it extends, so to speak, beyond \( Min_w \) in comparing beliefs in \( A \) and \( C \).” [p. 273]

This means that when we use (92) as the definition of informational independence, the box property is not a problem because we also look at those \( Min_w(X) \)-states, where \( \llbracket \phi \rrbracket \) and its complement are open possibilities. \( Min_w(X) \)-states are the ones that leave intact most of the information an agent has in his current state \( \sigma \). Intuitively, these are the most similar information states to \( \sigma \) only differing in leaving \( \phi \) open.

It is quite common sense that counterfactuality and causality are deeply intertwined. Hence, one could be drawn to the conclusion that Franke’s (2009) modified definition of informational independence is a natural way of spelling out Francez’s (2015) claim that causal (and epistemic) dependencies have to play a role in carving out the notion of independence. Indeed, if an agent knows that \( \phi \) actually is false and also assumes that \( \phi \)}
and $\psi$ do not causally depend on one another, in a revised minimal state she should not and will not give up the assumption of causal independence. Surprisingly, Francez (2015) rejects Franke’s (2009) solution to the box problem on doxastic grounds. He takes it that the interpreter does not have enough access to how the speaker revises her beliefs. But as I have already argued (in section 3.1), the representation of the states of the speakers only takes into account information that is in principal accessible to the interpreter and, vice versa, information that the speaker takes to be accessible to the interpreter. So, if it is shared between interpreter and speaker that the propositions in question have to be independent, this information will be used to represent the speaker’s state. Hence, Francez’s (2015) criticism is not well-founded.

However, the ambiguity problem stays alive on the counterfactual definition of informational independence. Take a modified version of the example given in Mandelkern and Rothschild (2018). An agent considers the possibilities that Sue is at the party and that Bill is at the party. This time, she knows that Sue is not at the party for sure. But she does not know about any dependence between Sue’s being there and Bill’s being there. If she suspends her belief that Sue is not at the party and considers a state where it is an open possibility whether Sue is there or not, again, the two propositions in question are informationally independent. Again, receiving information that Sue and Bill go everywhere together will undo this counterfactual informational independence. Put differently, if an agent is ignorant about a dependence between two propositions, and knows the actual values of one or both, counterfactual revision leads to an information state where informational independence is satisfied. Hence, the counterfactual or belief revision definition in (92) does not encode why and how independence for a $\mathcal{BC}$ interpretation is stable throughout updates.
Though, I am convinced that Franke’s (2009) idea about going counterfactual is right, we have to take a closer look at how counterfactuality and (in) dependence are related. This is what I set out to do in the next section 3.4 where I suggest to take some machinery from premise semantics for counterfactuals to get to a modified notion of independence. With this at hand, I show how independence can be encoded as a stable, transcontextual constraint within the common ground.

3.4 Modeling factual dependencies and independencies

In this section I introduce some basic formal machinery that is independently motivated by the analysis of counterfactual if-constructions. I show how this formalism provides the necessary tools to carve out the notion of independence at play in the interpretation of bc. This notion overcomes the problems of informational independence (aka orthogonality), but also allows to keep the explanation of ce given by Lauer (2015) and Franke (2009). In fact, I push the basic idea of premise semantics for counterfactuals one step further in showing that we need the very same machinery not only for the evaluation of counterfactual if-constructions, but also for the evaluation of indicative conditionals to predict and model whether an if-construction in question receives a bc or an hc reading.

3.4.1 Counterfactuals and dependencies

Lewis’s (1973) classical analysis of counterfactual conditionals like ‘If kangaroos had no tails, they would topple over’ is based on the notion of a similarity relation among possible worlds. To evaluate a counterfactual conditional one has to look at the most similar worlds to the actual world at which the antecedent is true and check whether the consequent is true there as well. However, besides the most basic formal properties of the similarity relation, Lewis’s (1973) analysis struggled with how to determine which
aspects of worlds are relevant for the comparison in terms of similarity. Lewis’s (1979) first suggestion is to compare worlds in terms of what is true at them. A similar world is one that only minimally departs from what is true at the actual world.

A counterexample to this kind of similarity account was brought up early on by Tichý (1976):

“Consider a man, call him Jones, who is possessed of the following dispositions as regards wearing his hat. Bad weather invariably induces him to wear a hat. Fine weather, on the other hand, affects him neither way: on fine days he puts his hat on or leaves it on the peg, completely at random. Suppose moreover that actually the weather is bad, so Jones is wearing his hat.” (Tichý 1976: 271)

Now, we are asked to consider the counterfactual conditional ‘If the weather had been fine, Jones would have been wearing his hat’ and whether it is true or false with respect to the scenario. Intuitively, the conditional is false, because Jones might not have worn his hat when the weather is fine. However, Lewis’s (1973) analysis predicts the sentence to be true, since in the most similar world to the actual world, with respect to what is true at this similar world, Jones wears his hat. Even though Lewis (1979a) suggests some amendments that solve the problem with this particular example, more counterexamples pertaining to the very same difficulties are brought forward in Bennett (2003); Edgington (2004, 2011); Schaffer (2004). These modified counterexamples cannot be accounted for with Lewis’s (1979) amendments. In this vein Veltman (2005) gives his own modified version of Tichý’s (1976) counterexample.

“Suppose that Jones always flips a coin before he opens the curtains to see what the weather is like. Heads means he is going to wear his hat in case the weather is fine, whereas tails means he is not going to wear his hat in that case. Like above,
bad weather invariably makes him wear his hat. Now suppose that today heads came up when he flipped the coin, and that it is raining. So, again, Jones is wearing his hat.” (Veltman 2005: 164)

How to evaluate ‘If the weather had been fine, Jones would have been wearing his hat’ in these circumstances? What we have to say is that the counterfactual conditional is true now. What is responsible for this shift in evaluation? Veltman argues that in each case we carefully have to look at how facts and propositions depend on one another. The trick in evaluating counterfactual conditionals is to only suspend with facts of the actual world or scenario the falsity of the antecedent (i.e. the complement of the antecedent) is dependent on and keep as much independent facts as possible. Indeed, this is the basic idea of Goodman (1947) that was taken up by Veltman (1976, 2005) and Kratzer (1981, 1989). Essentially, Veltman (2005) and Kratzer (1989) argue that we have to take two kinds of information into account to evaluate a counterfactual: what the facts are (or, what we take the facts to be) and what the dependencies between those facts are (or, what we take the dependencies to be), i.e. which facts ‘stand and fall together’.

As a side remark, this kind of two factor analysis is not open to Lewis (1973b). His analysis of counterfactuals is embedded in an overarching metaphysical project of reducing modal notions to non-modal relations amongst possible worlds. The major aim of his account of counterfactuals is to reduce dependencies amongst facts, in particular actual causal relations (see Lewis (1973a)), to counterfactual dependencies. And this amounts to analyze dependencies in terms of counterfactuals. However, the reflections and counterexamples from the literature cited above have shown that this reduction does not seem to be possible. In particular the theories of Veltman (2005) and Kratzer (1989) take the idea that facts depend on each
other to be fundamental and to be – at least for the analysis of counterfac-
tuals – non-reducible. The truth conditions of counterfactuals have to be
given in terms of the dependencies between facts, where dependencies are
an independent factor in the analysis. 23

Yet, there are two caveats. Logically and semantically, there is not much
of a difference between similarity semantics and premise semantics. The
differences pertain to the content of how the domain of possibilities that is
compatible with the antecedent is constructed. Since premise semantics is
much more concrete in carving out how context and semantics interact in
this process, it is able to make right and concrete predictions for particular
contexts. 24 Kratzer (1989) makes this point clear in claiming:

“[I]t is not that the similarity theory says anything false
about [particular] examples... It just doesn’t say enough. It
stays vague where our intuitions are relatively sharp. I think we
should aim for a theory of counterfactuals that is able to make
more concrete predictions with respect to particular examples.”
(Kratzer 1989: 626)

One could easily use a similarity based formal framework and merge it
with the insights from premise semantics to claim that similarity is based
on dependencies. But this amounts to dependencies playing a separate and
independent role from similarity. The more adequate predictions of mod-
ern premise semantics are due to a richer ontology underlying the models,
where dependencies are taken to be (more or less) primitive. Importantly,
one has to be clear what the purpose of the analysis of counterfactuals and
the respective models is. The questions that Veltman (2005) and Kratzer
(1989) set out to answer are about the use of conditionals that we make
in linguistic and non-linguistic behavior. These are questions about cogni-
tion and language. And indeed, it is very natural to model an agent as
having assumptions about how facts depend on each other. However,

23 For philosophical criticism that, in particular, causal relations are more fundamental
(or primitive) than counterfactual dependencies, see Edgington (2011).
the metaphysical question about whether there really are dependencies (or modalities) in the world is a different one. The latter one is the one that Lewis worried about. Yet, the important point is that (human) agents reason as if there are these dependencies and that is why they have to be represented in a model of these agents. What the criticism of Lewis (1973b) amounts to in the current context is that his account does not make the right predictions about the linguistic behavior of these agents. But it is not necessarily the case that the metaphysical reductionist thesis is wrong. After all, one could argue with modern theories from physics that there are no macro level objects. But still, we act and reason as if there were these objects. A different, but related philosophical question is not only whether and what dependencies are, but also where they stem from and how assumptions about dependencies are justified. Are some of the assumptions about dependencies a priori and how are they linked to what agents perceive and learn? These questions are not at issue here. I take it to be obvious that assumptions about dependencies play a major role in our cognitive lives, in particular in the interpretation of linguistic devices like if-constructions. The underlying goal of this thesis is to spell out a part of the reasoning processes that guides the interpretation of if-constructions. This means to set up a model with a certain, underlying ontology that is explanatory and intuitively motivated. What I aim to show in the next sections is that the independently motivated ontology from premise semantics provides the necessary tools to spell out the notion of independence and, first, to overcome the problems of informational independence, but also, second, to show how orthogonality relates to the new notion.

### 3.4.2 Worlds, situations, facts and (in)dependencies

Veltman (2005) sets up a framework for the interpretation of antecedents of counterfactual conditionals. A central element of his account is the representation of factual dependencies (equivalently, dependencies between facts) to account for the different role of dependent and independent facts. See e.g. Spohn (2012) for opinionated answers to these questions.
in counterfactual revision to make room for the truth of the antecedent. For
the purpose of getting at a model of how if-constructions are interpreted, I
here make use of a modified version of Veltman’s (2005) separate representa-
tion of beliefs about facts and beliefs about dependencies between them
that is taken from Arregui (2011). The major difference of Arregui’s (2011)
perspective on Veltman’s (2005) basic idea and formalism is that where
Veltman (2005) directly starts with modeling cognitive states of agents and
their assumptions about (in)dependencies, Arregui (2011) starts on a more
objective level in directly building (in)dependencies into possible worlds
at an ontological level. With this, her take is more in line with Kratzer
(1981) and Kratzer (1989) in directly considering dependencies as present
in the ontologies of the models, but without having to introduce Kratzer’s
(1989) much more complex framework. However, in the second step of my
own analysis, I re-import the objectivized version of Arregui (2011) back
into a Veltmanian model of cognitive states. This allows me to establish in-
dependence in bc interpretations as a transcontextual constraint and, most
important, to show how the new (metaphysical) notion of independence
is linked to orthogonality and Franke’s (2009) model of deriving ce. The
formal representation separately tracks what is the case at a possible world
and which facts depend on each other in this world. The synthesis of the
mentioned accounts provides the tools to define independence between
facts at a world as factual (in)dependence. This definition will be put to
work in a Common Ground (CG) model of interpretation where a mutual
assumption of factual independence is responsible for a bc-reading of an
if-construction.

I first introduce some basic formal definitions of possible worlds, situa-
tions and facts. Based on this I discuss the notion of a dependence between
facts. With this it will get clearer what the fundamental problem of Franke
(2009) – and to a certain extend also Lewis (1973b) – is. I then elaborate on
the notion of dependence and independence of facts following Arregui’s
(2011) lead.
Standardly, in formal frameworks possible worlds serve a specific function. They are conceived of as entities that determine the valuation function for the atomic sentences of a (formal) language. A valuation function is a function from the atomic sentences of a language to truth-values. This captures possible worlds as truth makers of sentences. I follow Veltman (2005) in identifying possible worlds with atomic valuations, since this will facilitate the introduction of the notions of situations and facts. Hence, a possible world is a complete function from the atomic sentences of a language to truth-values (93). Propositions are sets of possible worlds. The denotation function \([\cdot]\) assigns propositions to sentences. These propositions comprise the worlds where the sentence is true. Complex sentences are defined standardly by Boolean operations on sets (94).

\[\begin{align*}
(93) & \text{ Definition: Possible world} \\
\text{Possible worlds } W & = \{w, v, \ldots\} \text{ are valuation functions from atomic sentences of a (finite) language } \mathcal{L} \text{ to the truth-values } \{0, 1\}, \\
W & = \{w : \mathcal{L} \mapsto \{0, 1\}\}^{26}
\end{align*}\]

\[\begin{align*}
(94) & \text{ Definition: Propositions and denotations} \\
\text{A proposition is a set of possible worlds. Propositions that are the denotations of sentences are those sets of worlds where the sentence is true.} \\
\llbracket p \rrbracket & = \{w \in W \mid w(p) = 1\}, \text{ where } p \in \mathcal{L} \\
\llbracket \neg \phi \rrbracket & = W \setminus \llbracket \phi \rrbracket \\
\llbracket \phi \land \psi \rrbracket & = \llbracket \phi \rrbracket \cap \llbracket \psi \rrbracket \\
\llbracket \phi \lor \psi \rrbracket & = \llbracket \phi \rrbracket \cup \llbracket \psi \rrbracket \\
\llbracket \phi \rightarrow \psi \rrbracket & = (W \setminus \llbracket \phi \rrbracket) \cup \llbracket \psi \rrbracket
\end{align*}\]

\[^{26}\text{ The restriction to finite languages is adopted from Veltman (2005)}\]
Except for the slightly non-standard view on possible worlds, these definitions are quite regular. With the identification of valuation functions with possible worlds, simple definitions of what situations and facts of a world are become available. Situations are just partial valuation functions, i.e. partial worlds. A situation may be part of more than one world. As a partial valuation function a situation only assigns values to some of the atomic sentences of the underlying language. Possible worlds as complete valuation functions thereby are *maximal* situations. At the other end of the spectrum of situations there are *facts*. These are *minimal* situations since they represent a specific mapping of an atomic sentence to one of the truth values. A positive fact of a possible world is the mapping of a sentence to ‘true’, and a negative fact is the mapping to the value ‘false’ at a world. Again, a fact may be part of more than one world or situation.

(95) **Definition: Situations**

A situation $s$ is a partial valuation function and, thereby, a partial possible world. $s$ is an assignment of truth values to only *some* atomic sentences of $\mathcal{L}$

Let $N$ be the set of all situations: $N = \{s \mid \text{there is } w \text{ s.t. } s \subseteq w \text{ & } w \in W\}$

(96) **Definition: Facts**

A fact is a pair of an atomic sentence $p$ of $\mathcal{L}$ and a truth value: $< p, \cdot >$. It is either a negative fact, $< p, 0 >$, or a positive fact, $< p, 1 >$. Since facts are *minimal* situations, facts are minimal situational constituents of worlds: $< p, 1 > \in w$ iff $w(p) = 1; < p, 0 > \in w$ iff $w(p) = 0$

27 For example the definitions of Kratzer (1989) are much more complex, but also might be more powerful. However, at this point, there is no reason to apply this more complex picture.
A propositional toy language with three atomic sentences $L = \{p, q, r\}$ and its interpretations can be represented with the table below. This allows us to read off the facts for each world and situation. For example, the situation \{\texttt{<p,0>,<q,0>}\} is part of $w_0$ as well as of $w_1$. Propositional denotations for some complex sentences are listed on the right.

<table>
<thead>
<tr>
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- $\llbracket p \rrbracket = \{w_0, w_1, w_2, w_3\}$
- $\llbracket \neg p \rrbracket = \{w_4, w_5, w_6, w_7\}$
- $\llbracket p \land q \rrbracket = \{w_6, w_7\}$
- $\llbracket (p \land q) \rightarrow r \rrbracket = \{w_0, w_1, w_2, w_3, w_4, w_5, w_6, w_7\}$

On the standard account of possible worlds from propositional logic, each fact of a world is given independently of other facts. Put differently, worlds are just agglomerations of facts, i.e. $w_0$ is just the set \{\texttt{<p,0>,<q,0>,<r,0>}\}. Values are assigned to atomic sentences one by one. What modern premise semantics (Kratzer, 1989; Veltman, 2005) aims to capture is that not all facts are independent, but that some facts depend on other facts and that the values of the dependent facts are given with the values of the facts they are dependent on.

For example consider a world where Mary comes to the party ($p$), Alfonso does not come ($\neg q$), the two had a bad break up ($r$) and Max goes to the laundry shop. It is very plausible to assume that the facts \texttt{<p,1>,<q,0>} correlate and that these facts depend on \texttt{<r,1>}. However, Max going to the laundry shop might be completely independent of this. On Kratzer’s (1981) terminology the facts \texttt{<p,1>,<q,0>,<r,1>} are lumped together, since if one of the facts changes, the others have to change in some way, too. For example, if there hadn’t been a break up, both would have been at the party, since, as a clingy couple, they go everywhere together.
Or consider Veltman’s (2005) modified Jones-example. Here, Jones’
wearing a hat depends on the coin-toss in case that the weather is fine, or,
on the weather being bad (independently from the outcome of the coin-
toss). Hence, if the fact that it is raining today is changed, there is still the
coin-toss which determines whether Jones wears a hat or not.

The problem of Franke’s (2009) notion of informational independence
(85) is that it only draws upon possible worlds in the information state as
agglomerations of facts. This means it only looks at the surface as far as
it is only concerned with the isolated values that sentences receive with
respect to a possible world and, hence, is unable to account for depen-
dencies between facts. This is why the ambiguity problem arises so that
the information state of an agent might satisfy orthogonality but is not
committed to it as a transcontextual constraint. Hence, Francez (2015) is
right in claiming that informational independence is merely a structural
property of an information state because it only takes into account the
distribution of isolated values over sentences relative to possible worlds.

What needs to be done is to explain why this structural property holds for
the interpretation of $\text{bc}s$. This question is answered if we take into account
dependencies between facts.

As already indicated, a dependence between certain facts is the relation
of one fact determining another. In the model set up so far we can think
of a factual dependence as an instantiation of a generalization. Examples
of these generalizations at hand are that whenever it rains Jones wears a
hat, or, that if you go with someone for lunch you sit where they sit, or,
if you are late and run out of the house you don’t put on a coat.\footnote{28} I defer
discussion of the issue of what the representation of a dependence relation
captures to section 3.4.6 after having introduced the formal framework and
having shown how it gives us the notion of independence crucial for the
interpretation of $\text{bc}s$.

\footnote{28} The first example is due to Veltman (2005), the latter two to Arregui (2011).
Following Arregui (2011) we can conceive of Veltman’s (2005) framework as giving possible worlds a finer-grained structure that not only represents what is true at a world but also how some propositions are made true by other propositions being true at this world via dependencies between facts. This is to say that most facts are not given on their own. Rather they depend on other facts holding at a world. Given that something is a fact of a world, i.e. that something has happened or is in a certain way, something other is a fact of this world, too. The facts of a world are connected by a web of factual dependencies. E.g. if there is a factual dependence between the weather being bad and Jones wearing a hat and it is a fact at world \( w \) that the weather is bad, the relation of dependence determines that it is also a fact at \( w \) that Jones wears a hat. The fundamental idea from Arregui (2011) is to split up a possible world into two components. First, there is a set of independent fundamental facts, i.e. the facts that do not depend on other facts, and, second, there are the dependencies between facts – on Veltman (2005) these fall under the category of laws – that determine the dependent facts. The set of fundamental independent facts of a world is the base of this world. I here adopt the assumption that a possible world has a unique base. This is not encoded in the formalism. Veltman (2005) and Arregui (2011) make clear that there may be more than one base for a world: “[T]here may be more than one way of ‘carving up’ the independent facts.” (Arregui 2011: 195) However, Veltman (2005) and Arregui (2011) only give examples where the world has a unique base. The assumption that I add here is that the context determines a unique base somehow. Hence, a base and a representation of the dependencies is all that is needed to derive a complete world. Put differently, on Arregui’s

29 Note that this is not directly how Veltman (2005) interprets his framework.
30 ‘Law’ on Veltman’s (2005) understanding is a very general and vague notion that comprises defaults, rules of thumb, normalities etc.
31 Similar assumptions are adopted in Starr (2014a), Lauer and Nadathur (forthcoming) and Francez and Baglini (2015) in the context of causal models. Context somehow determines the causal model that is salient and relevant. Schulz (2007) argues that it is a shortcoming of Veltman (2005) that one dependence model allows for multiple bases. This is indeed a major reason to adopt the more restrictive framework of causal models where a dependence model can only have one base.
(2011) take on Veltman (2005) possible worlds are constituted by a base and a set of dependencies. On the picture of possible worlds promoted here, they are not just agglomerations of facts, but agglomerations of facts plus dependencies between those facts. This is because possible worlds now are individuated by the dependencies and the base of independent facts.

3.4.3 Laws and dependencies

One major question is how to formally represent dependencies. Veltman (2005) introduces the operator □ into the language of his model that expresses ‘it is a law that . . . ’. Dependencies fall into the category of laws in this sense, i.e. a law that features two facts. What a law is, is left intentionally vague in Veltman’s (2005) exposition.

“It’s not just natural laws that are at stake here. Take for instance the proposition that bad weather invariably induces Jones to wear a hat, and think about the role this proposition plays in the scenarios sketched above. It is not a law of nature, of course, but it’s a law. We will not give it up when making counterfactual assumptions. […] Or take the conventional laws like the rules of chess.” (Veltman 2005: 166)

Hence, laws are sentences that are taken to be constitutive for a specific situation. They are sentences that an agent is not willing to give up with respect to his representation of the situation. Thereby laws are conceived of as fundamental for a certain situation.32

For the formal framework, Veltman (2005) introduces the constraint that the □-operator taking sentences (or formulas) of the propositional language $L$ can only occur as the outermost operator of a formula. What the □-operator does is to give a special status to some formulas of $L$. Indeed, every formula of $L$ can be a law in this sense. For the interpretation of

32 Kratzer (1989) is more explicit in carving out what a law-like generalization is. However, I do not need to go into these complications to present the basic idea of how Veltmanian laws, in particular dependencies, help us in explaining the phenomenon of bcs.
conditionals, counterfactuals and bcs alike, dependencies are particularly important. In Veltman (2005) dependencies are represented by material implications prefixed with the □-operator of the form □(φ → ψ). Dependencies as expressed on the level of $\mathcal{L}$ have the according truth conditions of material implications.

However, we have to be very careful. Veltman’s (2005) aim is to spell out the structure of the cognitive state of an agent that is needed to evaluate a counterfactual conditional. On his take a law is what an agent is not willing to give up. This means, that the status as a law is assigned by the agent. If she learns a law, a new sentence of the (agent’s) language will get assigned the □-operator. Hence, the notion of a law is subjective. Learning a law changes what the base of the worlds the agent considers are. However, with Arregui (2011) we build things up differently, i.e. not top-down from the cognitive state of the agent to the make up of the worlds, but bottom-up, from the worlds to the representation of the cognitive state. On this account, for each world the base and the set of laws are fixed and ‘given’ by the world itself. Hence, formulas of the language $\mathcal{L}$ have a special status with respect to each world. I.e. each world draws the difference between laws and non-laws and thereby of dependent and independent facts by itself.

In Arregui (2011) the starting point is a single world and the dependencies in that world. In this framework, each world $w$ has a law horizon $U_w$ which is the set of all possible worlds where the same set of laws and only this set of laws holds that pertains to $w$. Put differently, $U_w$ is the set of worlds where the facts are such that they are compatible with the laws and dependencies of $w$. Importantly, the facts in the worlds of $U_w$ are different than the facts in $w$ itself. $U_w$ represents the permutations of facts that are compatible with or allowed by the laws and dependencies of $w$. Obviously, $w$ itself is an element of $U_w$.

33 “For any world $w$, $U_w$ is the set of possible worlds that obeys the laws (regularities) operative in $w$.” (Arregui 2011: 192)
On the assumption that dependencies between facts are sufficiently represented by the material implication, if \( q \) depends on \( p \) in \( w \), all worlds in \( U_w \) have to make \( p \to q \) true. Even though there are other more suitable, but also more complex formats for representing dependencies than the material implication, they all share the feature that they capture that dependencies are functional.\(^{34}\) That means that the value of a dependent atomic sentence \( q \) (where value and sentence make up a fact together) is determined as a function from the values of the sentence \( p \) that \( q \) depends on. An example for the functionality of dependencies is given with Veltman’s (2005) adaptation of Tichy’s example. The fact that Jones wears a hat (\( q \)) depends on the weather being bad or the coin coming up heads (\( p \lor r \)). Hence, the functional dependence (here, as a material implication) is \((p \lor r) \to q\).

Furthermore, functionality also requires that the value of the dependent sentence is uniquely determined by the sentences it depends on, i.e. dependencies are also deterministic. This second point is, however, not given with Veltman’s (2005) original framework, since he uses material implications and (as a consequence) allows for non-unique bases. Schulz (2007) elaborates this criticism with the following aspects: using material implications does not allow for representing directionality of dependencies. Yet, I here stick to Veltman’s (2005) account, adding the stipulation to Arregui’s (2011) modifications that the bases of worlds are unique. With this, the proposal at least gets closer to approaches like Starr (2014a) that use the full power of causal models which, for reasons of complexity, I do not introduce here, but only approximate to.\(^{35}\) The problem of directionality is rather a technical problem that I put aside here, but note that e.g. a synthesis of causal models and the Veltmanian account probably provides a solution. Indeed, with the formal model we can desist from giving a spelled out formal representation of dependencies and treat the material implication approach as an illustrating placeholder. We treat fac-

\(^{34}\) In Veltman’s (2005) framework not all laws are functional, but only dependencies, i.e. there can be a law like \( \Box p \).

\(^{35}\) In Starr (2014a) dependencies are represented as structural equations following Pearl (2000).
tual dependencies as being part of possible worlds. \( U_w \) then represents dependencies indirectly as a set of worlds that are subject to the same set of factual dependencies without the need to spell out these dependencies. A central assumption, however, then still is that these worlds have unique bases.

\( U_w \) indirectly picks out the factual dependencies holding at \( w \) by collecting all the worlds with the same dependencies. With this kind of indirect representation we do not have to say something substantial about the exact format of dependencies, be it structural equations or material implications. We just assume that these dependencies are functional in the sense just described. \( U_w \) then allows to formally define the base of a world, i.e. the set of independent facts that do not depend on other facts in \( w \). Factual dependencies and the base determine the complete valuation for a world. We can think of the base as the set of initial conditions for a world.\(^{36}\) The factual dependencies then generate the dependent facts out of these initial valuations. Note that the base set is a situation, i.e. a partial valuation function.

The following definitions are modified versions of Arregui’s (2011).

\[
\begin{align*}
(97) & \quad \text{a. A situation } s \text{ determines a world } w \text{ w.r.t. } U_w' \text{ representing a } \\
& \quad \text{body of factual dependencies iff for all } w'' \in U_w': s \subseteq w'', \\
& \quad w'' = w. \\
& \quad \text{b. A situation } s \text{ is a base set for a world } w \text{ iff } s \text{ is a minimal situation that determines } w \text{ w.r.t. } U_w', \text{i.e. there is no } s' \subset s \text{ such that } s' \text{ determines } w.\(^{37}\)
\end{align*}
\]

A base is a set of facts, i.e. of atomic sentences and their valuations. It is a situation, that minimally determines a world, i.e. gives a complete valuation over the atomic sentences of \( \mathcal{L} \) relative to a body of factual dependencies represented by \( U_w \). If it is a positive fact of the base set of

\(^{36}\) Note that the term ‘initial conditions’ has a temporal connotation that we have to abstract from here. Initial conditions here rather means the facts that are fundamental and independent of other facts.

\(^{37}\) The definitions given here are slight modifications of Arregui’s (2011) definitions.
Table 3.1: Striked out worlds do not obey $\Box(p \rightarrow q)$

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<td>$w_6$</td>
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a world $w$ that the weather is bad and we take the dependence between weather and Jones’ wearing a hat holding at $w$, this gives us the dependent positive fact that Jones is wearing a hat at $w$. How the base set is determined with the definitions given is further illustrated with table 3.1. Assume that $p$ = ‘the weather is bad’, $q$ = ‘Jones is wearing a hat’, $r$ = ‘Diana is going out with Maggie’. Furthermore, the factual dependence holds that if the weather is bad Jones is wearing his hat ($p \rightarrow q$). Worlds that do not belong to $U_{w_1}$, i.e. worlds where the dependence $p \rightarrow q$ does not hold, are struck out. The base identified on the basis of the factual dependence for $w_1$ is a situation $s$ including two facts: $s = \{< p, 1 >, < r, 1 >\}$. $< q, 1 >$ is derived by the dependence and there is no other world $w_x$ in $U_{w_1}$ for which $s \subseteq w_x$.38

With Arregui’s (2011) framework we have a representation of possible worlds that, first, differentiates between the facts that hold at a world and the dependencies between the facts that hold at a world. Even though this representation is only indirect, it makes clear how we have to take factual dependencies into account. The basic idea of making the difference is facilitated by the notion of a base which singles out independent base facts of a world. Second, the framework gives a method to identify these independent fundamental facts of a with respect to the dependencies that hold at this world. Hence, with the notion of a base from Veltman (2005) Arregui’s (2011) framework comes with a notion of what an independent fact is. The facts in the base are those that are not dependent on any other fact.

38 Recall the assumption that each possible world has a unique base.
However, the notion of independence we are seeking for the interpretation of \( \text{bc}s \) has to be more general: we want to be able to arbitrarily pick two facts of a world and say whether they are independent from each other or not. With the definition of a base from Arregui (2011) we can say that two facts are independent if and only if no factual dependence holds between them and the facts in question are in the base situation. However, the facts that we are picking for the interpretation of a \( \text{bc} \), unlike base facts, may depend on other facts, e.g. that a certain person is hungry might depend on her not having had breakfast this day, and this might depend on the fact that she forgot to do the groceries the day before etc. And there being pizza in the fridge may depend on the host having done groceries the day before etc. Hence, independence between being hungry and there being pizza in the fridge is not directly independence between base facts, but has to be traced to independence in the base.\(^{39}\) Crucially, for \( \text{bc} \)-independence the facts that are independent are independent in the sense that the sequence of dependencies that leads to one of the facts has no dependence in common with the sequence that leads to the other fact.\(^{40}\) Hence, there are sequences of dependencies that are retraced to different, mutually exclusive base facts and to sequences that do not intersect, i.e. have no fact in common. Another example is that Jones wearing a hat is traced back to bad weather, whereas Diana’s going out with Maggie depends on the dinner arrangements. Jones wearing his hat and Diana’s going out with Maggie are independent via the dependence on different non-intersecting base situations. Furthermore, it may be that two or more base facts together determine one dependent fact, e.g. if we have a depe-

\(^{39}\) Importantly, base facts are atomic, i.e. valuations of atomic sentences of the language \( \mathcal{L} \).

\(^{40}\) Here, we may think of the structure of a world as a tree that tracks dependencies. Indeed, this needn’t be. For a more adequate picture, we would have to give dependencies the structure of a directed graph, perhaps with cyclicity. Working this out has to be left for the future.
dence like □(r ∧ s) → p. A first shot at independence then is that two facts are factually independent relative to a world \( w \) and \( U_w \) if and only if they can be retraced to two mutually exclusive subsets in the (unique) base set of \( w \).

In order to state a formal definition of factual independence, I adopt Veltman’s (2005) forcing in the version of Arregui (2011) in (98). This requires to move from the level of facts to the level of propositions, so that we can talk about dependence and independence of propositions. That a situation forces a propositions means that for any world \( w \) in \( U \) that the situation is part of, the world \( w \) is also included in the proposition \([p]\). I.e. there is something about the situation that forces that the proposition is true at these worlds. In other words, there is a law-like relation of dependence that ensures that the proposition holds at the world(s) in question. The concept of minimal forcing is intended to single out the least inclusive situation of a world in \( U \) that forces this world into the proposition at issue, i.e. a set of facts in the base of a world. Minimal forcing pertains to bases, because these are the minimal constitutional situations of worlds.

Recall that a proposition \([p]\) describes a situation \( s \) (which can also just be a single fact) where \( p \) is true and collects all the worlds \( w \) where \( s \subseteq w \). Factual independence of propositions relative to a world \( w \) and the dependencies (laws) holding at \( w \) represented by \( U_w \) is then defined relative to those situations that together with the dependencies determine whether the proposition is true or false at \( w \).

(98)

a. A situation \( s \) forces a proposition \([p]\) within \( U_{w'} \) iff for every world \( w \) in \( U_{w'} \) such that \( s \subseteq w \), \( w \in [p] \)

b. A situation \( s \) minimally forces \([p]\) within \( U_{w'} \) iff \( s \) forces \([p]\), \( s \subseteq s' \), where \( s' \) is the base set of \( w' \) and there is no \( s'' \subseteq s \) that forces \([p]\)

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41 If we allow for more than one base set, we would have to quantify over the base sets of a world \( w \), i.e. for all base sets the facts are traced to mutually exclusive subsets.

42 Again, the definitions given here depend on the postulation that a world has a unique base.
Two propositions \([p]\) and \([q]\) are factually independent with respect to \(w\) and \(U_w\) iff \(s'\) minimally forces \([p]\), \(s''\) minimally forces \([q]\), and \(s' \cap s'' = \emptyset\), where \(s', s'' \neq \emptyset\).

Accordingly, propositions are factually independent relative to \(w\) if and only if whether they are true or false at \(w\) can be traced to mutually exclusive subsituations in the base of \(w\). Note that this even holds for common cause structures.\(^{43}\) If two facts \(b\) and \(c\) depend on the same fact \(a\), on the definition provided \(b\) and \(c\) are not independent. This is indeed intended for accounting for common cause structures.\(^{43}\)

Still, the definition provided in (99) is too coarse. It illustrates the basic idea, but cannot handle all cases, since it is too much focussed on the actual dependencies in a world and does not sufficiently account for the law-like character of dependencies as represented by \(U_w\). Getting \(U_w\) involved is important, because a fact possibly depends on more than a single other fact. Particularly, there can be disjunctive law-like factual dependencies like \(\Box(p \lor q) \rightarrow r\) that occur with a dependence like \(\Box q \rightarrow s\).\(^{44}\) If there is such a disjunctive law-like dependence established, there will be worlds in \(U_w\) for all possible combinations of values except those that make the factual dependence false. For tracking down these dependencies adequately we have to look at the bases of each world \(w'\) in \(U_w\). Then, if the set of all base facts that a certain fact depends on does not overlap with the set of all base facts that another fact depends on, the two facts are factually independent. For this to work we have to collect the base facts of each world in \(U_w\) that the first fact depends on, similarly for the second fact and then check whether these collections overlap.

With this we arrive at a slightly modified definition of factual independence in (100). The major difference to (99) is that (100) involves universal quantification over the bases of worlds in \(U_w\).

\(^{43}\) Without taking time into account.
\(^{44}\) Anyway, disjunction (in antecedents) is a messy issue in the domain of conditional constructions.
Two propositions $[p]$ and $[q]$ are factually independent with respect to $w$ and $U_w$ if the set of all situations $s' \in U_w$ that minimally force $[p]$ does not overlap with the set of all situations $s'' \in U_w$ that minimally force $[q]$, 
\[
\{s' \mid s' \text{ minimally forces } [p]\} \cap \{s'' \mid s'' \text{ minimally forces } [q]\} = \emptyset,
\]
and the following conditions are satisfied

\begin{enumerate}
\item there exist such $s'$ and $s''$ (non-emptiness)
\item $[p] \neq [q]$, i.e. the propositions in question are not identical
\end{enumerate}

In this section I have shown how to use some ideas from the literature on counterfactual conditionals to provide definitions for independence (and dependence) between facts. This was done by adapting tools from premise semantics, in particular, a simple version of situation semantics. However, the definitions given in (99) and (100) are in need of further precisification. The main idea, however, is that we have to look at the bases of worlds in the law sphere ($U$) to figure out which facts are independent.

Hence, the take home message is that we need a representation of the dependencies between facts that allows to draw the difference between the base and the facts dependent on the base. However, with Arregui (2011) I have chosen an indirect representation of dependencies that is rather uncommitting to the exact (formal) format of dependencies. More explicit formal frameworks that also implement the difference between a base and the dependencies between base facts and dependent facts like ones that adopt the causal models framework might be more suitable.\footnote{See Dehghani et al. (2012); Francez and Baglini (2015); Kaufmann (2013); Lauer and Nadathur (forthcoming); Santorio (2019); Schulz (2007); Starr (2014a) a.o.} This would require a thorough comparison between Veltman’s (2005) account and representations that use causal models. However, working this out is left for another occasion.
3.4.4 Towards factual independence in a CG model

In the preceding section I have provided Arregui’s (2011) rendition of Veltman’s (2005) framework. It enabled a finer-grained view on possible worlds that takes into account dependencies between facts. Importantly, with this account at hand we are able to define when facts of a world are independent and when propositions are independent relative to a world. This was enabled by an extension of the ontology of the model where we now have facts, situations and, additionally, dependencies. The notion of a factual independence is first and foremost a metaphysical notion of the model, i.e. dependencies pertain to possible worlds and connect the facts within the worlds. What we need to do now is to utilize this notion in modeling the dynamics of information states, in particular conversational states, to get a grip on how assumptions of independence figure in the interpretation of BC interpretations.

I have talked about several notions of independence by now and it is crucial to keep them apart. First, there is the target notion of independence operational in the interpretation of BCs. The aim of our model is to explicate this notion. Second, there is Franke’s (2009) definition of informational independence as orthogonality. Though CE can be explained with it, I have shown that it is not entirely adequate to account for the phenomena. In the last section factual independence as a metaphysical notion was introduced. In the next paragraphs and sections I aim to bring the latter two explications together to arrive at a model of agents who assume that certain facts and, respectively, propositions are factually independent.

The fine-grained view on possible worlds needs to be added to a model of the interpretation of utterances. Since dependencies between facts are encoded in (structured) possible worlds by a base and a web of dependencies, we can go on to model information gain as eliminative updates to a standard representation of information states as sets of (fine-grained) possible worlds. For modeling conversational states I adopt the Stalnakerian model of communication and its dynamics of information exchange (Stalnaker, 1978, 2002, 2014). On this account conversation takes place against
a background of information shared by the discourse participants. This is represented by the Common Ground (CG) which is the set of propositions mutually taken for granted for the purpose of the conversation. The most abstract goal of an exchange following Stalnaker (2014) is a communal inquiry regarding what the actual world looks like, i.e. answering the question of which propositions (or, rather sentences) are true at the actual world. The CG has a context set $cs$ associated to it: this is the set that comprises all the worlds that are live options or candidates for being the actual world, i.e. all the worlds where the shared CG propositions hold and that are compatible with the shared information. Modeling propositions as sets of possible worlds, the $cs$ is the result of intersecting all the propositions in the CG. If a discourse move of a speaker is accepted by the other discourse participants, by default the content of the move is added to the CG. In case of an assertion, a proposition gets added to the CG. Hence, the effect of an assertion is that the $cs$ shrinks by eliminating all worlds that are not elements of the asserted proposition. Successful communication in this framework is driven by the requirement that discourse participants coordinate on their individual views of what is mutually taken for granted.

The standard Stalnakerian account is centered on shared information about facts. That means, that only one-by-one valuations of sentences are taken into account. The two kinds of shared information are not differentiated: information about which facts hold and information about factual dependencies. However, Arregui’s (2011) framework and the concepts of how to model a cognitive state from Veltman (2005) can be used to enrich the structure of the context set.

Differentiating between information about facts and information about dependencies between facts is facilitated by differentiating possible worlds where the shared facts hold and possible worlds where the shared dependencies hold, in the same manner as we differentiated between a world $w$ and its law horizon $U_w$. However, now we have to deal with incomplete information about facts and equivalently with incomplete information about dependencies. It is the aim of the framework to be able to represent this difference and with this to be able to model how agents can learn infor-
mation about dependencies. Indeed, we have all the tools to represent the different kinds of information as sets of possible worlds. First, there is a set of possible worlds that is compatible with the information about the facts that the agents have. These are the worlds where the facts the agents are (mutually) opinionated about hold. E.g. if the agents mutually believe it to be raining ($< p, 1 >$) and that Jones does not wear his hat ($< q, 0 >$), all worlds in the factual part of the information state are such that they comprise the situation $< p, 1 >, < q, 0 >$. Hence, the first element of our enriched model of the context set is the standard context set which encodes the shared assumptions about which facts hold. To mark this we add the subscript $F$ for ‘factual’: $c_{sF}$.

The second element is the set of possible worlds where all the laws and factual dependencies hold that the agents mutually believe to be operative at the actual world. I call this the law sphere $L$, which represents the shared assumptions about which laws/factual dependencies hold. It is the set that comprises all the worlds that are compatible with the mutually assumed dependencies.

The central point is that $L$ comprises the worlds where the assumed factual dependencies hold. Here is a toy example for a language $L$ with three atomic sentences $p, q, r$: The agents mutually share the belief that a dependence between $p$ and $q$ holds, $p \rightarrow q$. But they do not have an opinion about whether $r$ depends on another fact. The worlds in $L$ that represent this state then all figure the dependence $p \rightarrow q$, but furthermore, there will be a world where $r$ itself is independent, one world where $r$ depends on $q$, where $r$ depends on $p$, where $p$ depends on $r$ etc. If the agents now learn something about dependencies concerning $r$ this is modeled by elimination of worlds that are not compatible with what was learned, e.g. at least ruling out all the worlds from the information state $L$ where $r$ is independent. In this sense, the dependencies that are represented by $L$ are incomplete, for every world in $L$ there hold more dependencies about which the agents do not have beliefs. This makes it possible in this model for agents to learn about additional dependencies by adding them to their stock of assumptions and eliminate the possibility of a certain
dependence relation by eliminating worlds from \( L \). With Arregui’s (2011) move of putting dependencies into the world, the dynamics of information gain with respect to dependencies can be represented standardly, i.e. by eliminating worlds where the learned dependence does not hold from the set of worlds \( L \).

Importantly, the two sets \( cs_F \) and \( L \) are related by subsethood: \( cs_F \subseteq L \), since every world where the shared facts hold also has to be a world where the assumed factual dependencies hold. With this we arrive at an information store \( IS \), which is a tuple of a factual context set and a law sphere \( < cs_F, L > \) which respectively represent what the discourse participants presuppose about the facts and what they presuppose about the laws.\(^{47}\)

Thereby, shared information about factual dependencies encoded in \( L \) restricts what can be accepted factually and so guides how \( cs_F \) may evolve. Veltman (2005) hence claims that “the general laws [i.e. dependencies] set a limit to the factual information one can have.” (Veltman 2005: 166) The worlds that are in the \( IS \) are, first, the worlds compatible with the factual dependencies taken for granted in \( L \) and, second, the worlds that are compatible with the shared facts and the laws and dependencies in \( cs_F \).

Here is an example to illustrate how \( cs_F \) and \( L \) are linked. If it is shared that it is a fact that \( < p, 1 > \), but the value of \( q \) is undecided, in every world in \( cs_F < p, 1 > \) is a fact. But we will find worlds where \( < q, 1 > \) is a fact and worlds where \( < q, 0 > \) is a fact in \( cs_F \). We can adopt the

\(^{46}\) See Starr (2014a) and Snider and Bjorndahl (2015) for similar accounts targeting counterfactuals. These two accounts also make use of structured possible worlds with which an eliminative update approach can be sustained.

\(^{47}\) The term presupposition is used throughout as referring to the Stalnakerian notion of speaker presupposition, i.e. information that has Common Ground status and is entailed by the context set (Stalnaker, 1974a, 1998, 2002, 2014). However, the notion of a contextual assumption is also slightly different than speaker presupposition, because the former cannot be accommodated. This is different from the classical examples of speaker presuppositions given by Stalnaker.

\(^{48}\) The term ‘information store’ is due to Isaacs and Rawlins (2008) and is inspired by relational databases. They argue that for representing modal subordination and subjunctive counterfactual questions the Stalnakerian context set has to be extended with information about worlds that are not candidates for actuality. In our case, this is done by \( L \) where the facts are permuted.

\(^{49}\) This is the same as saying that \( cs_F \subseteq \llbracket p \rrbracket \).
same strategy for the shared information regarding dependencies. If it is
a shared dependence that \( p \rightarrow q \), all the worlds in \( L \) are subject to this
dependence. I.e. if a dependence is conceived of as a material implication,
in all worlds in \( L \) the material implication will be true. In our example,
we will, via the knowledge of the dependence, also get \(< q, 1 >\) into \( CsF \)
and eliminate \(< q, 0 >\)-worlds. However, if the agents are not decided or
ignorant about whether \( r \) and \( s \) depend on each other, we will find worlds
with dependencies like \( r \rightarrow s, s \rightarrow r \) and worlds where \( r \) and \( s \) are factually
independent amongst \( L \). Even though, she might know the actual values
of the sentences in question. Note, that it is not possible to set up the
\( IS \) just on the basis of factual information, i.e. it does not suffice to take
all the possible worlds \( w \) where the shared facts hold and attend only to
their respective universes \( U_w \) since the latter do not necessarily reflect the
assumptions about laws of the agents.

These considerations give us the means to model the Stalnakerian con-
text set in a way that encodes accepted facts, dependencies and even in-
decision about dependencies. In the latter case we find worlds in \( L \) where
there is dependence between the facts in question and also worlds where
these facts are independent. As said, learning about a dependence then
amounts to ruling out worlds incompatible with the learned dependence.
Afterwards, the agent does not count as ignorant about a dependence any
more. For an assumption of dependence of \( s \) on \( r \) for example, we will only
find worlds in \( L \) where this dependence holds.

### 3.4.5 Assuming factual independence

In this way we are now able to model an assumption of factual indepen-
dence in this way: Two propositions (or the respective facts) are assumed to
be factually independent relative to a body of assumed laws/dependencies
represented by \( L \) iff the propositions in question are factually independent
(in the sense of (100)) for every world in \( L \). If \( L \) admits dependencies like
\( p \rightarrow q \) and \( p \rightarrow \neg q \) the agents are not opinionated about a particular de-
pendence between \( p \) and \( q \), but they assume some kind of dependence.
Hence, \( p \) and \( q \) are not factually independent with respect to \( L \). Indeed, it is the crucial point of this framework that with \( L \) we can make a difference between the assumption that a number of different dependencies are possible and that there is no dependence between two facts. Conversely, if there is no world in \( L \) where a dependence between the facts/propositions in question holds, these facts are assumed to be independent. This spells out Francez’s (2015) informal proposal that “biscuit readings do not arise from [informational] independence of the relevant issues on the speaker’s epistemic state, but instead from dependence of the issues in the common ground being ruled out [AG] by mutual knowledge about causali [sic!] and epistemic dependencies” (Francez 2015: 17). Assuming factual independence between propositions then amounts to adopting a global constraint on the structure of the possible worlds in \( L \), i.e. that in no world the respective facts are linked by a dependence relation. This amounts to the constraint that an update with a dependence between the facts in question is not considered to be possible (without major revisions).

Modeling independence as a constraint on \( L \) is thus an informed choice that takes several problems into account and in the end circumvents some. One perspective on agents’ assumptions about independence is that from what agents know about dependencies and the generalizations that govern this knowledge it follows or it is implied that the facts in question are independent. However, a formal account of this kind of implication seems quite difficult since independence is the absence of a dependence. Here, we run into a similar problem that we have already encountered: not having an opinion about a dependence is also a kind of an absence of a dependence in the model. So, modeling this conception of an assumption of independence in a direct way is not trivial at all. Such an envisaged framework has to make clear what the formal form of the dependencies is. I have already hinted to the fact that this is not easy and thereby I have restricted the current account to a general and vague functional representation. Even if these issues were settled, there remains the problem of spelling out the notion of consequence in such a system. In particular, the consequence relation that governs the notion of independence at play
in bc's has to be monotonic. This is to make sure that independence is stable across (eliminative) updates. But since we deal with incomplete information about dependencies, it is rather to be expected that if the body of information about dependencies changes, also the implications change. But if independence of facts is an implication of what is known about dependencies, again, the assumption about independence might also change. The major question then is what guarantees that independence still holds after an update.

This problem is very similar to the one that was observed with Franke’s (2009) account, i.e. how to model independence as a stable, transcontextual assumption. The perspective on the problem of how an assumption of independence arises is then very much related to Mandelkern and Rothschild’s (2018) description of the problem. In their rejection of Franke’s (2009) account of independence and ce, they argue that there is no feasible formal model by now that can deal with updates with conditional information. In particular, any update with conditional information changes the (in)dependencies in the model. They conclude that there is no way to represent independence as a stable property that is preserved across (conditional) updates. Furthermore, from this they jump to the claim that the very idea of an independence driven account of ce is wrong. However, the accounts that Mandelkern and Rothschild (2018) discuss are all similar in that they share with Franke’s (2009) account that independence (and also dependence) are just structural properties of plain information states as sets of (simple) possible worlds. Hence, these accounts do not have the necessary structure to encode independence as a stable constraint. An additional, less important point is that these accounts from formal epistemology are centered on the dynamics of the structural properties and also on how constraints with respect to conditional information emerge e.g. from statistical data. Though, these are very interesting questions, for

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50 Mandelkern and Rothschild (2018) also discuss probabilistic frameworks. If one would enhance them with counterfactual probabilities, one could achieve a similar result like my account of independence. However, how to make sense of counterfactual probabilities is highly contested. Anyway, Mandelkern and Rothschild (2018) do not discuss this possible extension.
the purpose of modeling these issues can and should be dismissed. The project of formal pragmatics does not need to give a formal account of why the independence assumption is in place, only that it is in place and how it functions as a transcontextual constraint. Modeling independence in the framework presented here does not engage in spelling out what a system of dependencies consists in or what its specific properties are. Though, it presupposes the notion of a system of dependencies. With this, updates are modeled by standard elimination of worlds. These updates determine what licit subsequent updates are possible. Hence, the global constraint of independence on $L$ is explanatory, since it is a plausible formalization of Francez’s (2015) conceptualization of independence as ruling out dependence.

The account I develop here is based on the assumption that for understanding how agents interpret utterances of if-constructions and similar linguistic structures an independent account of what conditional information consists in is needed. I here use the framework of Veltman (2005) and Arregui (2011) that goes back to premise semantics (Kratzer (1989)). But I also use resources from the literature on causal models springing from Pearl (2000). This is not to say that these are the only possible ways to go. There may be other frameworks that may be able to model updates under preservation of independence (perhaps with Spohn’s (2012) ranking functions). The important point is that the assumption of an independent account of dependence is substantiated by the data about the interpretation of $\text{bc}s$ and was argued for by several scholars to be necessary for the interpretation of counterfactual/subjunctive if-constructions.\textsuperscript{51} This in turn gives even more reason to conceive of if-constructions and especially of $\text{bc}s$ as purely quantificational constructions that are linked with specific pragmatic inferences without encoding conditionality into the semantics of if-constructions. Rather, what we need to understand is why if-constructions are so suitable to indicate dependencies. And this can be done if speaker’s presuppositions about dependencies which are based on world knowledge are taken into account.

3.4.6  Laws or dependencies?

In this section I try to make more precise what the notion of independence that was elaborated above conceptually consists in. As mentioned, Veltman (2005) dubs dependencies, but also other kinds of generalizations, ‘laws’. Every formula of the underlying formal language $L$ that is prefixed with the law operator $\Box$ counts as a law in Veltman’s (2005) account. However, at least for the purpose at hand, dependencies are the most important kind of law. There remains the question of how to make sense of the talk about laws. In a preceding paper (Veltman (1976)), Veltman starts with the term ‘prejudice’ and arrives from there at the notion of a law.

“Within our frame, prejudices will function as the opinions a speaker in a particular context is not willing to give up, come what may, when he is discussing matters pertaining to any of the ‘real’ worlds […], i.o.w., prejudices are to function as propositions a speaker considers to be laws of nature.” (Veltman 1976: 254)

Later, Veltman goes on and claims:

“[…] I am interested in laws in use, and not in the question of how they came into use. I want each [law] to function as the set of propositions that constitute a speaker’s theoretical field of view at a certain moment.” (Veltman 1976: 255)

Veltman here makes the point that I elaborated on in the preceding section. With respect to what is important for our project of modeling the interpretation of if-constructions as bcs, we do not have to say anything about the dynamics of laws themselves. We only need to take into account that there is a difference between information that is invariant and stable under certain changes and other accidental and more contingent information about the world.
Though in this context Veltman repeatedly speaks about ‘laws of nature’, he does not mean ‘real’ laws of nature. Later in Veltman (2005) he makes it very clear that he does not consider only laws of nature to be the relevant kind of generalization. What counts as a law is rather determined by the perspective of the agent. This is also the reason why in Veltman (1976) the starting point are prejudices, i.e. beliefs that are entrenched in the agent’s perspective of a current situation.\textsuperscript{52} These beliefs function as laws for the agent, but they need not have the character of actual laws ‘in the world’, though the agent might consider them to be real. Here, the examples of Arregui (2011) help to see that what is considered to be a law is quite weak: if you go with someone to the cinema, you sit where they sit; if there is somebody crossing a hanging bridge, you wait; that bad weather induces John to wear his hat. These are not ‘hard’ laws in the sense of logical, conceptual or natural laws. Rather, they are more like rules of thumb or default rules.\textsuperscript{53}

\textsuperscript{52} I here use the term situation in its common sense meaning, not as a term referring to the formal model.

\textsuperscript{53} At several points in Veltman (1976) Veltman points out that what is important is the theory that an agent employs and not whether this theory is adequate. Laws in his framework are not the laws that philosophers of science are interested in, but rather propositions that serve a specific function in the agent’s theory.

"A law in use is only a bet that a situation that does not obey this law will never occur. Our theories above all frame what we expect and do not expect of reality; they set out [...] our field of view. Therefore, I take a statement ‘It’s a law that A’ to be true if the speaker in question - rightly or wrongly does not reckon with a situation for which A does not hold. I want to account for the fact that our theories serve to guide us, and I think they do so quite independently of the question whether they are trustworthy or not. No doubt some of our theories are, from a methodological point of view, better justified than others." p.259

And later he claims:

"[...] I do not believe that there exist such things as laws which are discovered first, and known afterwards. Laws are hypotheses. They are made and not discovered: lawfulness is a matter of imputation." p.260
But importantly, this default character is not represented in the model. If something is a law relative to the model, it is fixed across the domain. No exceptions are allowed. This feature is discussed by Schulz (2007) (p. 112, Footnote 22) with respect to Fine’s (1975) counterexample (101) to Lewis’s (1973) analysis of counterfactuals.

(101) If Nixon has pressed the button, then there would have been a nuclear holocaust.

Schulz (2007) aims at synthesising Veltman (1976, 2005) and Pearl (2000) who both use the notion of law for dependencies. She states that for evaluating (101) the interpreter needs to employ a law like pushing the button $\rightarrow$ nuclear catastrophe. But in the background of this law is that additionally no abnormal conditions occur, e.g. that it is not the case that the wire that links the button and the nuclear bomb is cut. Hence, the relevant law would rather be (pushing the button $\land \neg$ abnormal conditions $\rightarrow$ nuclear catastrophe). But this non-monotonic aspect of certain generalizations is not represented in the respective frameworks. Indeed, it is important to keep this in mind when we are considering our common sense and also philosophical understandings of the relevant generalizations and how this is translated into the formal model.

Standardly, a law or law-like generalization, also the ‘weak’, ceteris paribus ones, are non-accidental generalizations.54 If these laws are not conceptual or logical but about contingent matters, they are often backed up by statistical data. Similarly, what agents take to be laws – their prejudices – are partly determined by their experiences. Laws then are propositions that have a general, abstract character, since they imply something about unobserved events. E.g. laws are abstractions from things of a certain class or from a certain kind that have a particular property or from events of a

54 See Kratzer (2012)[p.135 ff. on the problems of characterizing non-accidentalness.
certain kind that have particular features. This might be expressed with a
generic sentence like ‘Tigers have stripes’ or ‘Material objects in a gravitational
field move towards the center of gravitation’. The meaning of such sentences
is often analyzed as some kind of (modal) universal quantification.55

Indeed, this picture can easily be adapted for the analysis of the paradigmatic bc example repeated below.

(102) If you are hungry, there are biscuits on the sideboard.

The speaker can safely presume the hearer to share the very basic prin-
ciples and generalizations that structure human cognition. One of these
generalizations about the causal structure of our world is (103).56

(103) Sensations do not (directly) cause materialization of objects.

Similarly, sensations or states of mind cannot directly move material ob-
jects. Hence, the speaker can assume that it is a mutually shared assump-
tion that antecedent and consequent are factually independent. Note that
causal structure, or, to be more precise, independence with respect to
causality is central here.

We can without doubt assume that this kind of law-like generalization
is deeply entrenched in human cognition. Dehghani et al. (2012) argue
with respect to an analysis of counterfactual conditionals within the causal
model paradigm that the formalization of entrenchment relations going
back to Gärdenfors (1988) provides a useful tool to account for experimen-
tal data about the use of counterfactual if-constructions. Their experiments
are designed to test the causal model account and are interpreted such that
some beliefs about dependencies are more easily given up than others
which are assumed to be more entrenched. Such an analysis can be trans-
ferred to the interpretation of the paradigmatic bc (102). Faced with an
utterance of (102), the interpreter who is willing to accept this utterance,
i.e. implement it into her perspective on the common ground, has basically

55 For an overview of different analyses of generics, see e.g. Sterken (2017) and the refer-
ences therein.
56 See e.g. Sloman (2005) about causal reasoning and its importance for human cognition.
two possibilities. Either she infers that the sentence is intended as an hc, i.e. that her hunger will or can make it that there somehow are biscuits on the sideboard. Or she takes it to be intended as a bc. But on the assumption that independence between being hungry and there being biscuits on the sideboard is deeply entrenched into human minds because of certain generalizations, the hc option is not plausible. For an hc-interpretation the interpreter would have to give up a basic principle without any reason and would be forced to revise her beliefs about laws. But, coming back to Veltman (1976, 2005), what is considered to be a law by an agent cannot easily be given up. In particular, the interpreter of (102) has reasons to assume, via entrenchment, that the speaker also considers independence to hold. Hence, she will chose the bc-interpretation.

According to this informal picture of the interpretational process, it seems that what is central for the interpretation of (102) is something like the general law that sensations do not materialize objects. But at this point we again come across a tension between the commonsensical and also philosophical understanding of law-like generalizations on the one hand and what is formally modeled in the Veltmanian framework and its relatives.57 When talking about laws scholars often talk in a way that identifies laws (that sensations do not materialize objects) and the dependencies in the model which are unluckily also called laws.

57 These relatives are e.g. Santorio (2019); Schulz (2007); Starr (2014a) a.o.
Actually, the dependencies in the formal representation are not to be identified with general laws per se. The dependencies in the representation are rather particular instantiations of these generalizations. The tension between the general character of laws and the formal representation is also discussed in Schulz’s (2007) extension of Veltman (2005) with Pearl (2000). She also observes that one might understand laws in the formal presentation as (non-accidental) general statements. But laws as general (universally quantified) statements have several particular instantiations. If now, as in Schulz’s (2007) account of counterfactual if-constructions, one has to give up a law as a general statement, one would also have to give up each particular instantiation of this law. And this is highly problematic. But, as she claims, “on this level [of abstraction in the formal representation] laws are no general statements. They do not universally quantify over any variable” (Schulz 2007: 114/115).

The same point is made by Horty (2007) with respect to propositional accounts of default logic:

“Where A and B are formulas from the background language, we let \( A \rightarrow B \) represent the default rule that allows us to conclude B, by default, whenever it has been established that A. To illustrate: if B stands for the statement that Tweety is a bird, and F for the statement that Tweety can fly, then B \( \rightarrow F \) is the rule that allows us to conclude that Tweety can fly, by default, once it has been established that Tweety is a bird. This particular default can be thought of as an instance for Tweety of the general default Bird(x) \( \rightarrow F(x) \), telling us that, as a rule, birds are able to fly (to get from this general default to the particular instance B \( \rightarrow F \), think of B as an abbreviation for the statement Bird(Tweety) and of F as an abbreviation for Fly(Tweety)). It is, in many ways, easier to understand general default rules like this – defeasible generalizations – than it is to understand their particular instances. However, in order to avoid the complexities involved in a treatment of variables and instantiation in default logic, we restrict ourselves in this paper to a propositional language, and therefore focus only on particular defaults, rather than the defeasible generalizations they instantiate.”
Hence, I think it is better to make the difference between general statements and specific dependencies more clear in calling the particular instantiations of laws that are of interest here ‘factual dependencies’. To be sure, generalizations like (103) play a very important role in determining the dependencies in a certain situation, but they cannot be directly identified in the formal framework at hand.

We also have to keep in mind that what counts for our model, as well as for Veltman (2005), is the perspective of the agent(s). The agent has to decide which general laws she takes to apply in a specific situation, i.e. what counts as a dependence is centered on the agents. Dependencies are part of a model that the agent(s) build out of the contextual information they have. And this contextual information, apart from the (robust) beliefs about laws as general statements, guides how the model is build. The agent’s view of the context prescribes which general laws she takes to be instantiated in the particular situation. This in turn means that there are further contextual cues that guide whether the agent takes it that facts are dependent with respect to that situation or not. Temporal information is crucial here.

Consider the following sentence (104).

(104) If you are hungry, there will be biscuits in a minute.

Without context, (104) is ambiguous between a \(bc\) and an \(hc\) reading. The tendency out of context, though, will rather be a reading as an \(hc\) due to the the modal in the consequent. As soon as some contextual features, mainly temporal features that guide assumptions about (in)dependence, are fixed, it becomes clear which reading is intended. Consider a context where you are visiting a friend without having warned him. He opens the door, wearing an apron, hands and face covered in flour and he utters (104). You will understand that the baking of the biscuits is independent of your possible hunger, because he started making cookies before you knocked on his door. Hence, there will be biscuits in a minute anyway (ce) and the sentence is interpreted as a \(bc\), in particular as an invitation to have
some biscuits. However, imagine the following alternative scenario. You are visiting your grandma, you are sitting on the sofa having a chat. Your stomach starts rumbling. She notices, immediately jumps up and utters (104). In this case, (104) will be interpreted as an \( \text{HC} \). Your being hungry makes it that your grandma starts baking so that there will be biscuits in a minute. Antecedent and consequent will be interpreted as dependent.

What plays a major role here is the interpreter’s conception of the temporal relations of events in the specific situation. The role of these relations is not only important for the overall interpretation of \( \text{BCs} \), but also applies to the interpretation of other \( \text{if} \)-constructions. E.g. in their analysis of so-called anankastic conditionals \( \text{if want} \ p, \ \text{must/should} \ q \) (Condoravdi and Lauer, 2016), the authors emphasize the role of what is inferred by the interpreter about the temporal relations in the context (Condoravdi and Lauer 2016: 53). Even though the standard implication in these constructions is one where \( q \) is a means of achieving the goal \( q \), this implication only arises if there is a temporal precedence between \( q \) and achieving the goal. Temporal inclusion, coincidence or precedence in the opposite direction give rise to different pragmatic implications and readings of anankastic \( \text{if} \)-constructions which arise pragmatically. Indeed, this carries over to \( \text{BCs} \).

In the case of \( \text{BCs} \), temporal information and information about which law-like generalizations apply guide whether the interpreter can take antecedent and consequent to be independent. Importantly, this kind of information is oftentimes indicated by linguistic means. As Merin (2007) notes, there are specific linguistic cues that guide the interpretation and limit the scope of the available readings.

“Lexical and inflectional information, including indicators of tense, along with their respective semantic interpretations and convictions about the physical world make the assumptions of causal independence in [a biscuit interpretation] acces-
sible to every linguistically competent listener. If any of these lexical or grammatical features are modified, the scope for consequential [i.e. hc] readings will usually increase.” (Merin, 2007)[p. 21]

This is taken up by Biezma and Goebel (2019)[p. 17] who observe that almost all bcs in the literature contain stative predicates in the consequent, e.g. if you are hungry, there are biscuits on the sideboard. With a stative predicate it is easier to bring about the interpretation that the time of the event in the antecedent and the time of the event in the consequent overlap and hence that the event in the consequent cannot depend on the antecedent. In particular, there can be no causal relation, since this would require a discrete sequence of the events, one being the cause (or rather part of a cause or something about the causal history of the consequent) and the other being the effect. With overlap that contributes to or indicates independence, the bc reading will be much more likely to arise. This difference is shown with (105), where (105-a) in normal circumstances receives a bc reading and (105-b) receives an hc reading. (105-a) features a stative predicate, where (105-b) features future tense.

(105)  a. If you are hungry there are biscuits on the sideboard.
       b. If you are hungry there will be biscuits on the sideboard.

However, in particular with respect to (105-b), its hc interpretation is not entirely determined by the future modal will. The hc reading is rather a default interpretation that can be overridden by other contextual cues as we have seen with (104).

Relatedly, Romero and Csipak (to appear) show that only specific combinations of tense and aspect give rise to biscuit readings of counterfactual if-constructions. However, they argue that these specific combinations of tense are a semantic source of ce, which is different from and additional to the inference modeled by Franke (2009) and in chapter 3. On the perspective offered here, this does not seem to be adequate. Tense and aspect are very strong triggers for independence. Indeed, they can be guides to independence. That tense is a different mechanism from the independence inference seems to be implausible when considering that time and causality (the ‘contingent’ face of dependence) are so intimately intertwined as observed by many philosophers.

59 Relatedly, Romero and Csipak (to appear) show that only specific combinations of tense and aspect give rise to biscuit readings of counterfactual if-constructions. However, they argue that these specific combinations of tense are a semantic source of ce, which is different from and additional to the inference modeled by Franke (2009) and in chapter 3. On the perspective offered here, this does not seem to be adequate. Tense and aspect are very strong triggers for independence. Indeed, they can be guides to independence. That tense is a different mechanism from the independence inference seems to be implausible when considering that time and causality (the ‘contingent’ face of dependence) are so intimately intertwined as observed by many philosophers.
To wrap up, let’s get back to Veltman’s (1976) quotation from the beginning of this section.

“[...] I am interested in laws in use, and not in the question of how they came into use. I want each [law] to function as the set of propositions that constitute a speaker’s theoretical field of view at a certain moment.” Veltman (1976)[p.255]

Indeed, in the model that I have build upon Veltman (2005), laws and generalizations play a central role. However, I have argued, that the dependencies in the model are not to be confused with general statements. These have been used prior by the agent to arrive at the model of the specific situation. If the agent thinks that right here, “at a certain moment” being hungry and there being biscuits is independent, this will be stable across all worlds of $L$. This model of the current situation is the theoretical field of the agent at a certain moment. Again, general statements (laws) should not be confused with the factual dependencies in the model, that are specific instantiations of those generalizations.

60 Similar points are made by Francez and Baglini (2015) who analyze the meaning of to manage in terms of causal models.

“Both the dynamics and the relevant situation [of the causal model in question] are thus contextual parameters, and when a speaker utters a manage sentence, they are assuming that certain causal generalizations about familiar contextually relevant variables are common ground.”

And they add in footnote 5:

“How exactly the dynamics and the catalyst is determined is of course an interesting question. Presumably, this is an extra-grammatical, pragmatic process that relies heavily on world knowledge and specific assumptions in the conversational context. [...]”

Equally, how agents arrive at the independence assumption in a bc interpretation in a specific situation relies on a complex system of inferences, that are not bound to language matters.
3.5 Deriving $ce$ from contextual coherence

Having discussed how to understand the notion of independence in the Veltmanian model I come back to the question of how to derive $ce$ in $bcs$ from the contextual assumption of independence. This will be done in an extended Stalnakerian model of communication by a synthesis of the model of the assumption of factual independence and Franke’s (2009) derivation of $ce$.

In section 3.4.4 I suggested to model the Common Ground of a conversation as an information store $IS$ which is a tuple $< cs_F, L >$ of the factual information that the discourse participants share and the shared information about (in)dependencies. With this, an assumption of independence can be represented via the structure of $L$, i.e. that there is no world in $L$ where the two facts in question are dependent. The important point here is that factual independence and orthogonality (informational independence) can be linked on this view. The fundamental principle introduced above is that $cs_F$ has to be a subset of $L$, because all factual information has to comply with the information about dependencies. This makes possible to derive $ce$ more or less along the lines of Franke (2009), but without running into the same problems.

Recall that if orthogonality is satisfied in a non-trivial way, i.e. in non-box cases, the information state $\sigma$ has a specific structure. Assume that propositions $\llbracket \phi \rrbracket$ and $\llbracket \psi \rrbracket$ are non-trivially orthogonal to one another w.r.t. information state $\sigma$. This means that we will find $\phi \land \psi$-worlds, $\phi \land \neg \psi$-worlds, $\neg \phi \land \psi$-worlds and $\neg \phi \land \neg \psi$-worlds distributed over $\sigma$. Such a structure of the Stalnakerian context set is furthermore the default context for the utterance of an indicative $if$-construction. The latter carries the presupposition that the antecedent proposition is an open possibility with respect to the context set and in default circumstances this also means that there are also worlds in the context set where the antecedent is false. Importantly, the latter observation is a fact about the specific use of an $if$-construction in context. The presupposition $\Diamond \phi$ does not rule out cases where the context set is a subset of the proposition $\llbracket \phi \rrbracket$, i.e. where it is
established that $\phi$. These are cases where the if-construction at issue is interpreted as a factual conditional. However, there are some reasons for taking it to be the default that worlds where the antecedent is false are also elements of the context set. Cariani and Rips (2016) call this pragmatic principle $\textit{Negative Possibility}$ (106).

(106) Negative Possibility: To evaluate an indicative conditional (if $A$)(B) in context C, the context must be compatible with $\neg A$.

The rationale for this principle with reference to von Fintel (2001) is given in the following quote.

“The motivation behind Negative Possibility is that if $A$ were settled in [context C], a speaker who was in a position to assert (if $A$)(B), would also be in a position to assert the stronger $\textit{It must be the case that B}$. For Gricean reasons, then, asserting (if $A$)(B) would signal that the speaker envisions some possibilities in which $\neg A$. For example, in asserting $\textit{If it was raining, Alicia got wet}$, we invoke a state containing worlds in which it was not raining, as well as worlds in which it was.” (Cariani and Rips 2016: 18)

Yet, this reasoning cannot be wholly adequate. Otherwise we would never observe factual uses of if-constructions. What happens in the case of the latter is that the form of an if-construction is used to trigger specific inferences from the mapping to the discourse structure. And these inferences are what is at the core of the difference between $\textit{hc}$ and $\textit{bc}$ readings. This will be the subject of chapter 4. Furthermore, a competition along the lines of Cariani and Rips (2016) does not hold for $\textit{bc}$s, because we have informational equivalence. On Cariani and Rips (2016) a speaker would (always) chose an assertion of the consequent over the assertion of the if-construction in $\textit{bc}$ contexts. This is clearly inadequate. But, the principle
of Negative Possibility – as a default rule – suffices to justify that the structure in figure 3.1 is the default structure of a context for the utterance of an if-construction of the form if $\phi, \psi$. Bringing up the antecedent possibility $\phi$ by default triggers the inference that there may be alternatives to $\phi$.

Let’s come back to modeling ce. In contrast to our information store, Franke (2009) only takes into account a single information state that represents the possible worlds that are candidates for actuality, which is equivalent to the original Stalnakerian context set. Using the information store picture of a cognitive state, orthogonality in Franke’s (2009) account only applies to $cs_F$. But this is the major problem for Franke’s (2009) account. If the agent learns something factual, i.e. that one of the propositions of the subject matter \{[$\phi$], [$\neg \phi$], [$\psi$], [$\neg \psi$]\} is true, the information about independence is lost and orthogonality is satisfied trivially. Yet, the link between orthogonality and assumptions of factual independence can be made when $L$ is taken into account.

As said, an assumption of factual independence that resides in $L$ induces orthogonality on $L$. This is because for all the worlds in $L$ the facts in question have to be independent and thereby all combinations of truth-values for antecedent and consequent have to be present. Yet, orthogonality as a structural property will only be transcontextually stable if it is induced by an assumption of factual independence. Mere orthogonality (85) can also be satisfied if the incomplete assumptions about dependencies of an agent (or agents) are indecisive with respect to a dependence between $\phi$ and $\psi$. With respect to the dependencies in such an $L$ state there will be worlds
where there is a dependence and worlds where the facts are independent. However, if in such a state a dependence between $\phi$ and $\psi$ is learned, worlds where the facts at issue are independent will be eliminated and orthogonality will not be satisfied anymore. Mere orthogonality cannot differentiate between the two kinds of scenarios – factual independence and ignorance –, because it only looks at the distribution of facts amongst the worlds and not at the (in)dependencies. To make the difference, we also have to look at the factual dependencies of and in the worlds that make up $L$, which is facilitated by the framework introduced in the preceding sections. If the finer structure of worlds with factual dependencies holding for them is taken into account, we can differentiate between the different grounds for orthogonality.

The information stored in $L$ only pertains to factual dependencies and how these dependencies restrict the facts, or, put differently, how facts can permute within the confines of the assumed factual (in)dependencies. Hence, assumptions about factual dependencies rule out certain combinations of facts. An assumption of independence then has a specific effect on the counterfactual worlds ($cf$). These are elements of the subset of the worlds in $L$, i.e. $cf = \{w | w \in L \text{ and } w \notin cs_F\}$ where facts are permuted in line with the assumed factual (in)dependencies. Because the facts for counterfactual worlds in $L$ permute, it follows that if two facts are independent, there will be all of the possible permutations of values amongst these worlds. Hence, if factual independence is assumed and holds for all worlds in $L$, orthogonality relative to $L$ will always be non-trivial (i.e. non-$\Box$). Only relative to $cs_F$ orthogonality can be satisfied trivially, even if an assumption of factual independence holds. Factual independence hence is not subject to the box problem. For factual independence in $L$, orthogonality is either satisfied non-trivially and transcontextually or not satisfied at all.

With these interrelations between factual independence and orthogonality relative to $L$ and orthogonality relative to $cs_F$ it is possible to derive CE on the basis of the Franke-Lauer account. An assumption of factual independence between two propositions $\llbracket \phi \rrbracket$ and $\llbracket \psi \rrbracket$ induces an ‘extended’
coherence requirement between $cs_F$ and $L$ with respect to orthogonality. The first, ‘basic’ coherence requirement was formulated by Veltman (2005): $cs_F \subseteq L$. I.e. all worlds that are compatible with the assumed facts also have to be compatible with the assumed factual dependencies. The coherence principle that I draw upon extends this requirement in the sense that whether orthogonality between $\llbracket \phi \rrbracket$ and $\llbracket \psi \rrbracket$ must be satisfied by $cs_F$ or not is determined by $L$ if orthogonality between $\llbracket \phi \rrbracket$ and $\llbracket \psi \rrbracket$ in $L$ is induced by an assumption of factual independence. In this case the structure of $cs_F$ may not ‘contradict’ orthogonality from $L$, i.e. $cs_F$ has to satisfy orthogonality. The derivation of $ce$ then is in line with Franke’s (2009) account which is based on the idea that the interpreting agent of an if-construction strives to uphold the mutually shared assumption of independence. In particular, if the interpreter takes the consequent $\psi$ to hold within the part of $cs_F$ where the antecedent $\phi$ is true, and she takes factual independence to hold, she cannot go on to assume that $\neg \phi$ makes a difference to $\psi$ being true.

Informally, the interpretation proceeds in the following way. The interpreter assumes that the propositions in question are factually independent and takes this to be common ground. Additionally, factual independence is entrenched. That means, it is no option for the interpreter to give up the assumption of factual independence and its common ground status. On these assumptions the interpreter has to keep the proposed update to $cs_F$ in line with what is assumed about $L$. And this is modeled by upholding orthogonality for $cs_F$.

3.5.1 A dynamic framework

To get more precise about the pragmatic mechanisms of consequent entailment in bcs within the factual dependencies framework, I adopt a dynamic account of if-constructions following Rawlins (2010) (building on Heim (1983)). The update potential of an if-construction $\phi > \psi$ acts on an IS. I assume the restriction that an if-construction in the indicative mood targets $cs_F$. Only by additional pragmatic inferences it can also bring about effects
in $L$. Furthermore, as claimed above the indicative conditional comes with the presupposition that the antecedent is compatible with $cs_F$, i.e. that there are antecedent worlds as live possibilities. Hence, it has to hold that $cs_F \cap \llbracket \phi \rrbracket \neq \emptyset$. Informally, the antecedent $\phi$ restricts the context set $IS$ to the worlds in $cs_F$ where $\phi$ is true. This restricted set gets updated with the consequent proposition $\llbracket \psi \rrbracket$. If the consequent is a declarative, all the worlds where $\psi$ does not hold get eliminated from the restricted context set. After this update, the restriction of the context set to the $\phi$-worlds is lifted. From the perspective of the unrestricted $cs_F$, all worlds where $\phi$ is true but $\psi$ is not get eliminated from $cs_F$. The function of the antecedent is to introduce suppositions that restrict the view on the $IS$.

Simplifying Rawlins’s (2010) framework, the information store $IS$ gets extended with a slot $a$, the view on the context set, that tracks assumptions (therefore $a$), i.e. suppositional restrictions on $cs_F$. $a$ is a set of worlds, i.e. a proposition. So, the $IS$ now is a triple: $<a, cs_F, L>$. If there is no (mutually shared) assumption established, i.e. if the view on $cs_F$ is not restricted, then $a = W$. $W$ is the underlying domain of possible worlds (e.g. Logical Space). The ASSUME operator introduces restrictions on the view. If an assumption is made, either the empty assumption set ($a = W$) or an already existing restricted assumption set is intersected with the assumed proposition.

$$IS + ASSUME \phi =<a \cap \llbracket \phi \rrbracket, cs_F, L>$$

61 On the view developed here, this is the case with the interpretation of $ics$. In contrast, as spelled out in Veltman (2005), counterfactual conditionals semantically pertain to $L$. The restriction of indicative conditionals to $cs_F$, or, equivalently to the classical Stalnakerian context set is argued to be a pragmatic constraint by Stalnaker (1975, 2014). Williams (2008) argues for semanticising this condition. I do not take a stance here on the issue whether the condition is pragmatic or semantic.
Note that with this definition of ASSUME via intersection suppositions can add up. Crucially, the assumption slot $a$ is to function as a filter on subsequent updates. This means that if there is a (mutually shared) supposition/assumption in place ($a \neq W$), updates under this supposition only pertain to the restricted portion of the context set, i.e. the set of live worlds where the supposition is true.

Updates under a supposition/assumption are modeled via domain-limited update (cf. Bledin and Rawlins (2019); Kaufmann (2000)):

$$ x \oplus_a \llbracket \psi \rrbracket = (x \cap a) \cup (x \cap a \cap \llbracket \psi \rrbracket) $$

$x$ is a variable for a proposition, in our case for the context set $cs_F$. $a$ is an assumption, e.g. introduced by the antecedent of an indicative if-construction and $\psi$ represents the consequent. $\oplus_a$ is the update operation under a (possibly empty) supposition in $a$ and the result of the update operation is a set of worlds.

In figure (108) the context set updated with $\llbracket \phi \rrbracket$ under a supposition $a$ is composed of the light gray area – the worlds where the supposition and the updated information holds – and the darker grey area $cs - a$. These are the worlds filtered out by the supposition $a$, i.e. the options that are not ‘in view’ as long as the assumption is in place. This means that this region cannot be subject to updates. Only in the intersection of $cs$ and $a$ the update with $\llbracket \phi \rrbracket$ takes effect. Here, the $\llbracket \phi \rrbracket$ worlds get eliminated.

As said, suppositions can add up. But the assumption slot also needs to get cleared. This is done by the CLEAR operation that resets the assumption slot to $W$. Thereby, CLEAR eliminates all restrictions.

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62 In this definition the variable $x$ is used because the update operation can also be employed on other elements of the information store. This becomes relevant in cases of counterfactual/subjunctive if-constructions. Following Veltman (2005), the set which is subject to the update is a particular subset of $L$. In chapter 4, following Bledin and Rawlins (2019) the representation of the context is extended with questions under discussion (QUDs). Via domain-limited update, $a$ also works as a filter on this QUD stack.

63 On the framework presented here, single assumptions of multiple assumptions cannot be cleared. I.e. if there is a sequence of suppositions $(p, q)$, $q$ cannot be cleared singularly. Only the whole assumption slot can be reset. Isaacs and Rawlins (2008) offer a framework where a step-by-step reset is possible.
Assertive updates then are defined via the ASSERT operation that updates the information store relative to possible suppositions:

\[(110) \quad IS + ASSERT \phi = < a, cs_F \oplus \llbracket \phi \rrbracket, L > \]

With these definitions and operations the dynamic semantic update potential of an (indicative) if-construction is broken down into two steps: the introduction of a supposition via the antecedent on the assumption slot and the assertion of the consequent in the so-restricted context, (111).

\[(111) \quad IS + if \phi, \psi = IS + ASSUME \phi + ASSERT \psi = < a \cap \llbracket \phi \rrbracket, cs_F \oplus \llbracket \psi \rrbracket, L > \]

The dynamic semantics for a counterfactual if-construction works quite similar except for the fact that the operations have to apply to a revised context set derived from L relative to which the antecedent is possible. See Veltman (2005).

The reader is referred to Rawlins (2010) for a comprehensive explanation of these definitions.
One might critically note that it seems as if the assumption slot was only introduced for the sake of providing an interpretation of if-constructions. Though, if-constructions are the most prominent expressions that introduce suppositions, there are others as well. E.g. the verb ‘to suppose’, but also phenomena that are filed under modal subordination. One example for the latter is (112) that features the epistemic modal ‘might’.

(112) A thief might break into the house. He would take all the silver.

The second sentence is interpreted relative to those live context worlds where the thief breaks into the house, i.e. under the supposition that a thief breaks in. In our model, the content of the first sentence works as a filter in the assumption slot. Modal subordination of this kind is often marked by linguistic means. However, Isaacs and Rawlins (2008) note that it is not always clear what triggers the lifting of a supposition, i.e. the setting in of the CLEAR operation which resets the assumption slot to the non-restricted domain $\mathcal{W}$. I here take it as the default that after the utterance of an if-construction the assumption slot is reset by the CLEAR operation, i.e. after the interpretation of the if-construction the IS returns to a state where $a = \mathcal{W}$.

### 3.5.2 Updating towards ce

We have now a worked out dynamic account for the semantics of indicative if-constructions at hand. With this it is easier to see how ce arises from this dynamics.

As already said, ce from factual independence arises relative to a default $cs_F$ for the utterance of an if-construction where neither antecedent nor consequent are established. This kind of context was characterized above with the help of Cariani and Rips’s (2016) principle of negative pos-

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66 However, note that not all suppositions are equivalent. See Bledin and Rawlins (2019) on the difference between ‘suppose $\phi$’ and constructions featuring if-clauses.

67 Factual uses of if-construction e.g. arise relative to non-default contexts where the antecedent is established by a directly preceding update. In this case ce is not due to the factual independence inference. See section 3.3.1, p. 65.
sibility (106), where there are antecedent and non-antecedent live worlds in
the global (factual) context set $cs_F$. However, in contrast to Cariani and Rips
(2016) I weakened the principle of negative possibility (106) to a default
rule that can be overridden by discursive needs, i.e. for generating particu-
lar inferences. More formally, the default structure of the context set $cs_F$ for
the utterance of an $if$-construction is one where there is at least one world
for every truth-value distribution over the conjunction of antecedent and
consequent ($\phi$ and $\psi$). This default context structure satisfies orthogon-
ality (85) in the non-trivial sense, i.e. orthogonality is not induced by one
proposition being established already. The structure of such a default IS
as a whole is visualized in figure 3.1 above. If, additionally to the default
structure of the IS there is an assumption of factual independence in play,
orthogonality has to be maintained across updates. I.e. there is pragmatic
pressure from world knowledge to maintain orthogonality. This means
that future $L$s have to satisfy orthogonality non-trivially and future $cs_F$s
have to satisfy orthogonality trivially or non-trivially.

Now, what happens if we put these assumptions about the initial con-
text as an IS with a default structure and an assumption of factual indepen-
dence together with the dynamic picture of $if$-constructions worked out
in the previous section in (111)? The update potential (111) for indicative
$if$-constructions can be characterized as purely quantificational. This is
captured by the eliminativity of (111), but can in principle also be achieved
by a test semantics (Veltman, 1996). What is required by a plain indicative
$if$-construction is that all antecedent worlds are consequent worlds. On
its own, an indicative $if$-construction is not sensitive to factual dependen-
cies. Applying the (semantic) update potential leads to the exclusion of
$[[\phi]] \cap [\![\psi]\!]]$-worlds from $cs_F$. The resulting structure is represented in fig-
ure 3.3. Semantically, nothing about the remaining non-antecedent worlds
($[[\phi]]$) is encoded. Domain-limited update by the $if$-construction semanti-
cally induces that $cs_F$ does not satisfy orthogonality (85) any more.
Accepting the if-construction if $\phi$, $\psi$ amounts to accepting the conjunction $\phi \land \psi$ under the supposition of $\phi$. Yet, if this comes together with the assumption of factual independence, the interpreter will and has to infer something about the possibilities where $\neg \phi$ holds. Actually, if the interpreter believes that $\phi$ and $\psi$ are independent, and she accepts that $\psi$ holds throughout the $\phi$ possibilities, there is no reason to assume that $\psi$ does not hold throughout the $\neg \phi$ possibilities. $\neg \phi$ on the assumption of factual independence just makes no difference to the truth of $\psi$ if $\phi$ and $\psi$ are assumed to be factually independent. If factual independence is assumed, it is a rational requirement to infer that $\psi$ holds throughout the entire $cs_F$ by coherence.

From the semantics of the indicative if-construction we have non-orthogonality with respect to $cs_F$ but orthogonality induced by the assumption of factual independence with respect to $L$. Since $L$ restricts what can be known or believed factually, $cs_F$ has to be compatible with the assumptions in $L$. But then, the structure of the information store depicted in figure 3.3 is incoherent.

There are two possible ways for an interpreter $I$ to react if she arrives at an incoherent perspective on the shared information store: (i) $I$ might come to the conclusion that her assumption that factual independence is a feature of the IS, i.e. that it is a shared assumption, is wrong. The speaker doesn’t assume independence. So $I$ would have to revise her take on the IS. This amounts to either reject the update proposal, if $I$ holds on to her independence assumption or to revise and accommodate, i.e. give up
the independence assumption and go for a dependence, i.e. go for an \( \text{hc} \) reading by also ruling out \( \phi \cap \psi \) worlds from \( L \). In any of these ways, the interpreter \( I \) has to revise her assumptions about the IS, in particular she has to revise \( L \).\(^{68}\) The second option (ii) is to accept the uttered if-construction and search for a minimal (pragmatic) modification or enrichment to the update semantically proposed by the speaker which satisfies simultaneously the constraints by the semantics of the if-construction and the assumption of factual independence. Furthermore, the interpreter \( I \) in this case takes the inference to this minimal modification to be intended by the speaker \( S \), since \( S \) is also assumed to take the assumption of factual independence to be common ground.

(i) is excluded for normal contexts, in particular, for the paradigmatic examples like 'If you are hungry, there are biscuits on the sideboard', since factual independence between the propositions in question is assumed to be fundamental and easily accessible so that it will naturally be taken to be shared. If \( I \) takes factual independence to be shared, easily accessible to all discourse participants and well entrenched with respect to the system of laws and dependencies they share, (i) definitely is excluded for \( I \). Giving up assumptions about factual dependencies and independencies is not done without good reasons which \( I \) lacks in the paradigmatic biscuit scenarios. It is a general rule that “we are not prepared to give up propositions that we consider to be general laws” (Veltman 2005: 166), where we might want to add an ‘without reason’. Revising robust beliefs about generalizations comes with cognitive effort and costs. Hence, undergoing such revision has to be justified for the agent.

If factual independence is sufficiently entrenched in this sense, \( \phi \times \psi \) receives a \( \text{bc} \) reading. If the prior context is additionally a default context where neither the truth nor the falsity of antecedent or consequent are established, consequent entailment (ce) arises as a consequence of (ii). \( I \) takes the speaker to likewise presuppose factual independence and to propose to update \( \text{cs}_F \) such that all antecedent worlds are consequent

\(^{68}\) How such a belief revision is to be modeled in a principled way is a task for formal epistemologists and does not pertain to the use of natural language.
worlds. All constraints on $cs_F$ from (86-a), (86-b) and from $L$ have to be satisfied by an update. $\phi$-worlds cannot be ruled out because of the presupposition that the antecedent has to be a possibility with respect to $cs_F$. The only minimal modification to the update of $cs_F$ that satisfies the constraints of the semantics of the if-construction and aligns with orthogonality by factual independence in $L$ is the exclusion of all $\psi$-worlds from the non-restricted $cs_F$ (depicted in figure 3.4).

With this, $\psi$ is true throughout the whole context set $cs_F$ and we have derived consequent entailment from a requirement of dependence coherence on the information store $IS$. The inference to $CE$ guarantees that orthogonality is satisfied in $L$ as well as in $cs_F$. Put differently, $CE$ is derived via the mechanism suggested by Franke (2009) and Lauer (2015) with the major difference that on the framework incorporating factual independence the mechanism is anchored and it is justified why it takes effect, i.e. why orthogonality is maintained. This solves the problem pointed out in Mandelkern and Rothschild (2018) that orthogonality is not maintained in any case.

It is important to keep in mind that it is not $CE$ that is typical for $BCs$ on this account. Rather, $CE$ is a consequence of the assumption of factual independence, the default structure of the context set for the utterance of an if-construction and the coherence requirements between $cs_F$ and $L$. What makes an if-construction a $BC$ is the assumption of factual independence! This is why the suggested framework can also account for factual if-constructions and their difference with respect to $BC$ or $HC$ interpretations.
For both varieties of factual if-constructions – bcs and hcs – the update to cs will be the same, i.e. excluding the antecedent and non-consequent worlds. The difference lies within L: if there is an assumption of factual independence, the antecedent and non-consequent worlds in L have to be retained (depicted in figure 3.5). If, however, L is compatible with a factual dependence between antecedent and consequent, an hcs reading will arise by also eliminating antecedent and non-consequent worlds from L (depicted in figure 3.6). The counterfactual implication of (89), that if the addressee was not hungry, the speaker wouldn’t necessarily make biscuits, is a consequence of the fact that independence is not presupposed in this case. For an hcs interpretation to arise L needs to be compatible with a dependence between the propositions in question. 69

![Figure 3.5: Factual bc](image1) ![Figure 3.6: Factual hcs](image2)

3.6 Conclusion

The Franke-Lauer account of the role of independence in the interpretation of if-constructions as bcs cannot differentiate between a case where an agent is ignorant about a dependence and where she assumes independence. Furthermore, it cannot deal with factual uses of if-constructions where the difference between hcs and bcs interpretations is present, too.

69 Oftentimes, this will go hand in hand with the interpreters knowledge of a generalization. What she learns then is that the generalization is instantiated in this case. Sometimes, even the generalization is learned from the utterance of an if-construction. However, I cannot go into this here, since the discussion of generic interpretations of if-constructions is far beyond the scope of this dissertation.
Hence, this account does not deliver a criterion by which we can decide whether a bc or an hc reading arises. Mere orthogonality, as suggested by Franke (2009), is not entirely sufficient to carve out the notion of independence, because on the Franke-Lauer account it is not clear why orthogonality should be maintained across updates. I have argued that we have to take into account the level of dependencies between facts, very much like suggested in the literature on counterfactual/subjunctive if-constructions. Adopting the model of Veltman (2005) and Arregui (2011) to give possible worlds additional structure facilitates establishing that a contextual feature, i.e. a mutually shared assumption of factual independence triggers bc readings and the oftentimes observed ce. The model of the common ground incorporating factual dependencies amends Franke’s (2009) account in important respects such that it gets clear why orthogonality of the propositions at issue is a stable and transcontextual requirement. Thereby, counterarguments to Franke’s (2009) explanation of ce (Mandelkern and Rothschild, 2018) are rebutted. Consequent entailment (ce) for a bc is shown to be a contextual inference from pragmatic pressure to maintain a coherent information store (IS). This aspect arises from an interplay of a standard restrictional semantics of the if-construction and specific shared world knowledge about dependencies between facts. However, ce is not a necessary feature of all bc interpretations. Rather, it is the mutual assumption of factual independence that guides interpretation.
Chapter 4

The discursive function of bcs

In the previous chapter I started from Franke’s (2009) account of ce (consequent entailment). He argues that ce in bcs is due to a contextual assumption of independence. I showed that Franke’s (2009) formalization of independence as mere orthogonality is not sufficient, since it makes wrong predictions in certain cases, especially in factual uses. Another consequence of this problem is that his take on the assumption of independence cannot provide a definitional property for bcs uses of if-constructions. Borrowing from premise semantics for counterfactual if-constructions in Veltman’s (2005) version, I carved out a notion of independence, i.e. factual independence, that, first, has the right properties to serve as a definition of bcs: a bcs reading arises in context if there is a mutual contextual assumption of factual independence with respect to antecedent and consequent. Applying this criterium accounts for factual uses of if-constructions as bcs, but also for the problematic cases from Siegel (2006). Second, I have shown that in the Veltmanian framework the notion of factual independence and Franke’s (2009) derivation of ce are complementary. The modified notion of independence contributes explanatory potential to Franke’s (2009) derivation, since it provides a justification of why orthogonality has to be maintained in a bcs interpretation.
With the factual independence account the first question (TQ1) for a theoretical account of the phenomenon of \( bc \) readings of \( if \)-constructions is answered. However, we still have to see what the answer to the second question (TQ2) is. Both questions are repeated for convenience below.

1. **TQ1**: What licenses interpreters’ inferences that the consequent is true unconditionally?

2. **TQ2**: What is the function of the \( if \)-clause? Why is it used?

What we have by now is a general criterium for \( bc \) uses and a derivation of \( ce \) that arises in default contexts. However, on the informational level the \( bc \) update and an update with the consequent (by a plain assertion of it) are equivalent. The difference between the two updates is in the kind of update. Where the global informational update for a plain assertion is encoded semantically and is direct, for a \( bc \) the resulting informational update is driven by pragmatic factors – i.e. factual independence – and is indirect via an inferential process. However, the overall effect is the same for both kinds of updates. It is a **pragmatic** equivalence, not a semantic one. The factual independence machinery shows why and how this can be. To be more precise, in \( bcs \) there are two informational updates. One semantic, i.e. updating the context set in such a way that all antecedent worlds are consequent worlds, and the second one pragmatic from factual independence that leads in most circumstances to \( ce \). The latter one is in its overall effect equivalent to the semantic update potential of just the consequent. But this finding does not provide answers to the issues that arise from **TQ2**. If there is (pragmatic) informational equivalence, why does the speaker choose the supposedly more complex form of an \( if \)-construction instead of a plain assertion of just the consequent?
The majority of semantic speech act accounts claims that bs have a specific illocutionary flavour that can be seen in (113). The interpreter understands that the utterance is a suggestion to eat some cookies if the addressee is hungry. Here, the illocutionary force is said to be one of *conditional* suggestion. And the restriction of the illocutionary force arising from the speech act operator is the reason for using the form of an *if*-construction. Similarly, a bs can also have the force of a command (114).

(113) If you are hungry there are biscuits on the sideboard.
    \(\sim\) In case you are hungry A suggests to take some cookies and eat them.

(114) a. If they ask you how old you are, you are four.
    \(\sim\) In case the addressee is asked she is commanded to say that she is four.

b. If a fire breaks out, the fire extinguishers are around the corner.
    \(\sim\) In case of a fire the addressee is commanded to use the fire extinguisher.

I have pointed out the problems for semantic speech act accounts, in particular for those that postulate speech acts for any kind of illocutionary force (multiple speech act accounts) in chapter 2. Let me briefly also point out that, although there are many cases of bs where inferences like the ones in (113) and (114) arise, there are also bs that do not give rise to such inferences, as witnessed by (115):

(115) If the zombies attack, I have my gun.

In (115) neither a conditional suggestion or command can be inferred. What is conveyed is that the speaker will use his gun in case of an attack.
The aim of a pragmatic account of bcs is to explain the illocutionary flavor via pragmatic inferences. This means to identify which conditions need to be fulfilled for these inferences to arise. Consequently, such an account also has the resources to explain cases where the particular inferences as such do not arise.

However, deriving the illocutionary inferences does not give a general answer to TQ2 about the function of the if-clause. The answer of speech act accounts referring to illocutionary forces is not general enough, though, the illocutionary flavor of some bcs has to be explained by a pragmatic account, too. What is needed instead is an independent characterization of the function of the if-clause.

I go through and adopt the general answer to TQ2 given in Biezma and Goebel (2016, 2019). On their account the semantics of if-constructions as quantificational expressions and the interaction with discourse structure is central in explaining the function of bcs. The inferences observed in (113) and (114) on this account can be explained as triggered by considerations about discourse structure. Their account leads to the insight that hcs readings as well as bcs readings are due to inferences from discourse structure. The general mechanism suggested by Biezma and Goebel (2016, 2019) with respect to bcs and some hcs of the form ‘if p, q’ is the following: the antecedent sets up a suppositional Question-under-discussion (QUD) which the consequent answers. What the interpreter has to infer is how the consequent can be an answer to the suppositional question. In the case of an hcs reading it is inferred by the interpreter that the relation between the supposition in the if-clause and the picked out alternative in the consequent is one of dependence. But this cannot be the case for bcs since antecedent and consequent are assumed to be factually independent. This means that factual independence restricts how the relation between consequent and antecedent can be build. But what kind of relation is build in bcs?
While Biezma and Goebel (2016, 2019) give a general account of how the form, semantics and discourse structure for an if-construction give rise to the question of how agents interpret consequents as answers in bcs, they leave a blank space with respect to formalizing this process. What is needed to complement their account is a concrete mechanism of pragmatic enrichment to, first, see how the independent consequent can provide an answer, and second, how from this the specific inferences that we see in (113) and (114) can arise. The basic idea of the discourse account of if-constructions is the following: The question that is set up by the antecedent gives – like any other question – a set of alternatives. The consequent as an answer gives information that helps to evaluate these alternatives. The problem that arises is to determine what the alternatives in the suppositional QUD are and, in particular, how independent information can serve to evaluate these suppositional alternatives. Accordingly, a mechanism of pragmatic enrichment should be able to do three things: 1) Specifying a range of alternatives to evaluate, 2) relating the (independent) information of the consequent to the (suppositional) alternatives, and, 3) explain on that basis how the specific illocutionary inferences arise.

In section 4.4.2 I spell out one way of pragmatic enrichment for bcs like the paradigmatic case (116). Borrowing from Csipak (2015, 2018) I label these bcs problem-solving or practical bcs, since these bcs center around actions and goals.

(116) If you are hungry, there are biscuits on the sideboard.

The term ‘problem-solving’ is used as a descriptive notion for the interpretational phenomenon. Especially, a practical interpretation is present if illocutionary inferences to the effect of a permission, suggestion or similar arise. One advantage of speech act accounts is that they can explain these inferences via postulated speech act operators. But not all bcs and indeed not even all practical bcs give immediately rise to such inferences. However, the prominent and paradigmatic examples carry those inferences and
indeed we can see them with most \textsc{bcs}. This is why it is important to offer an explanation of practical readings within the pragmatic account, i.e. to identify the features and mechanisms that lead to a problem-solving reading.

For spelling out this process I use insights from philosophical theories of rational agency. One central piece of decision theory is that agents have to make use of (independent) information to solve problems about which action to take, i.e. to arrive at a decision. Decision theory uses so-called decision matrices for representing how agents (should) decide for a particular option of acting by evaluating the options relative to states of the world, where states and options have to be independent to arrive at a decision. Agents pick options that satisfy their needs optimal relative to what they believe the state of the world is. Hence, my hypothesis is that decision matrices are a tool to make explicit the relevant space of alternatives for a suppositional question, and can also account for how to relate factually independent information in this space of alternatives.

Building on independently motivated linguistic applications of decision theoretic tools, I will argue that this picture of practical problem solving (or instrumental rationality) should supplement the QUD model of discourse. Agents do not just exchange and request information for its own sake. Humans are practical animals that have to satisfy their needs by successfully acting in the world. Additionally to asking \textit{‘What is the case?’} they also and primarily are interested in the question \textit{‘What to do?’}. The former question most of the time serves to find answers to the latter question. Therefore, practical problem solving and decision procedures guide communication. In particular, practical goals provide the reasons for setting up discourse in particular ways by specific linguistic forms, i.e. what is required to solve an informational question is partly determined by the practical goal that is the reason to ask the question (or set up discourse in a specific way) in the first place. This interaction between the QUD structure of discourse and practical goals can feasibly be formalized.
Practical \( \text{bc} \)s then work in the following way: For the supposition the interpreter can infer a practical problem or goal by either general or specific world knowledge. E.g. ‘if you are hungry’ gives rise to the practical problem of how to ease hunger. There may be different options. The consequent indicates that a precondition of one of the options is met, thereby ‘picking’ this option. ‘there are biscuits on the sideboard’ then determines the option of eating biscuits. Conversely, the consequent can also indicate that some options are out because their preconditions are not met. In this vein ‘If you want to go to Harlem, the A-Train has just left’ indicates that taking the A-train is not an option to solve the problem in the suppositional context. Note that in this case no suggestion or command is made since a salient option to solve the problem of how to get to Harlem is ruled out. Note also that the term ‘option’ is to be understood in a broad and abstract fashion. The option indicated by the consequent could also serve to indicate that there is no viable option, i.e. that a problem at hand can not be solved at all and the ‘option’ may be to do nothing.

Admittedly, this perspective on \( \text{bc} \)s requires quite some amount of general and particular world knowledge for inferring a practical goal for the suppositional context and relating the information from the consequent to this goal as a precondition. But such rich world knowledge is, e.g. also required to give an account of Gricean particularized conversational implicatures like (117) or (118).

(117)  
A: I am out of petrol.  
B: There is a garage round the corner. Grice (1989)[p. 32]

(118)  
A: The trash is overflowing.  
B: I’m busy doing my homework.

What I aim to show is that the same mechanisms that account for (117) (e.g. in Benz (2006, 2007)) and (118) account for \( \text{bc} \) readings of \textit{if}-constructions.
The decision theoretic extension of the QUD model allows to explain what the resolution, i.e. the space of alternatives in \textsc{bcs} is. It is a way of modeling what the factors are that guide the agents’ perspective on the relevant possibilities. The consequent in a \textsc{bc} helps to resolve this space of alternatives by either eliminating some alternatives (the A-train example) or by indicating one particular alternative (the biscuit example).

Notably, from this decision theoretic account an explanation for the illocutionary flavor of many practical \textsc{bcs} arises. I argue that this subclass of \textsc{bcs} is analogous to anankastic conditionals (‘If you want to go to Harlem, you have to take the A-train’) and pragmatically triggers a very similar form of practical reasoning under the condition that it is the interpreter’s preferences that are at stake. For this I build on Lauer and Condoravdi (2014) who present a pragmatic account of how anankastic conditionals serve to give advice. Some \textsc{bcs} trigger similar practical reasoning and serve to give permission, suggestion, or, to command. This account leaves room for the variegated class of \textsc{bcs} that do not have illocutionary flavor, because the latter is due to contextual conditions and arises as a pragmatical inference.

However, I have to preface this chapter with a caveat. Though the decision theoretic enrichment of the QUD model is motivated by, first, independent linguistic phenomena like mention-some questions (van Rooy, 2003), and, second, by general considerations about the structure of discourse (Roberts, 2012a, 2018), I’m not entirely sure how well the presented account generally applies to all \textsc{bcs}. How pragmatic enrichment works is still quite unclear. There may not be one unified mechanism for how pragmatic enrichment functions. There might even be several modules that work together. Yet, the basic idea of the mechanism I use here, i.e. taking into consideration practical goals, is on the right track for getting grip on one main possibility of how discourse participants ‘build’ alternatives. This confidence is supported by the fact that other phenomena are also explained by taking into account decision theoretic machinery.
As said, in this chapter I focus on problem-solving bcs. The paradigmatic bc ‘If you are hungry there are biscuits on the sideboard’ is the core example. I here only anticipate that utterance bcs like ‘If they ask you how old you are you are four’ – where what is conveyed is something about the utterance of the content of the consequent – may also be feasible within this framework. Csipak (2015, 2018) distinguishes problem-solving bcs from discourse-structuring bcs like (119). A characteristic mark of discourse-structuring bcs is that they are not compatible with past tense.\(^1\) I set aside this kind of bc, since the interpretation of such cases likely involves either an additional or different layer of pragmatic enrichment that I cannot account for here. Though these hedging constructions are bcs following the criterium of factual independence, the inferences they give rise to are more complex and more difficult to account for. They might have to do with politeness effects and self-referentiality. By all means, the discourse account of Biezma and Goebel (2019) also holds for this kind of bc, but the pragmatic enrichment involved is more difficult to formally spell out.

(119) If I may say so, you look awful.

The plan of this chapter is to first introduce Biezma and Goebel’s (2019) discourse driven account of the interpretation of if-constructions in general and of bcs in particular. This requires some stage setting. I present the basics of the QUD model of discourse as devised by Roberts (1996, 2012b) in section 4.1. Section 4.2 expounds Biezma and Goebel’s (2019) account of how if-constructions map to QUD discourse structures. The adjoining section 4.3 advances Biezma and Goebel’s (2019) hypothesis that both, hc and bc readings result as inferences from pragmatic pressure in the sense of Lauer’s (2014) NaR (Need a Reason) implicatures.

\(^1\) Hence, ‘If they ask you how old you are, you are four’ does not belong to this class. This if-construction is perfectly fine in circumstances where an adult tells about how her child did a good job in lying: ‘If they asked Sue how old she was, she was four.’
Sections 4.4 and 4.6 - 4.7 take effort to respectively address two issues that are left open by Biezma and Goebel (2019). For the first issue: in Biezma and Goebel (2019) it is claimed that the antecedent of a bc serves to set up a suppositional question, i.e. a set of alternatives that the consequent evaluates. But what needs to be made more concrete is what kind of question this is, and more particularly, what kind of alternatives figure in it. Secondly, it also needs to be made more concrete how the consequent can evaluate these alternatives. For this I use Bledin and Rawlins’s (2019) insights on suppositional questions. Indeed, their account gets us into extending the QUD model with a dimension of practical goals which is independently motivated. This extension in effect also gives a way of constructing the information in the consequent of a practical bc as an answer to the suppositional question set up by the antecedent.

The aim of sections 4.6 - 4.7 is twofold. The methodology is at some points tentative since some aspects of these issues rather resist rigid formalization. First, by pointing out obvious parallels between so-called anankastic conditionals and paradigmatic bcs, I aim to justify the decision theoretic picture. This justification is based on Condoravdi and Lauer’s (2016) account of anankastic conditionals that uses very similar concepts like the ones in Bledin and Rawlins (2019). This also allows for sketching what kind of triggers guide interpreters in identifying practical goals via their general or specific world knowledge. The second issue concerns the illocutionary inferences that oftentimes – but not always – are associated with the use of practical bcs. Also, in this respect I build on the parallel to anankastic conditionals where we can observe (illocutionary) inferences that amount to giving advice. I suggest that the mechanism in bcs is similar to the one in anankastic conditionals as elaborated in Lauer and Condoravdi (2014). It allows to sketch under which conditions the illocutionary inferences in bcs arise.

Section 4.8 adds some comments on the generality of the approach given in the preceding chapters. Though this approach builds on general mechanisms, i.e. decision theory and a representation of practical goals, and indeed is able to explain the illocutionary flavor of paradigmatic cases,
not all bcs can be analyzed in this framework straightforwardly. For some cases additional mechanisms will be needed, for others it is not clear how to treat them in the goal-oriented framework presented. To account for these critical cases will be left for future research.

4.1 The QUD model of discourse

Biezma and Goebel (2016, 2019) argue that there is a particular interrelation between the syntax and semantics of if-constructions – their form – and discourse structure. To provide a precise account Biezma and Goebel (2016, 2019) use the concepts and formalizations of the QUD (Questions Under Discussion) model of discourse that goes back to Roberts (1996, 2012b). In general, the QUD account of discourse structure as used here provides a model of the Gricean program by spelling out discourse as a sequence of intentional moves – questions and answers – with a recognizable goal. These sequences are subject to constraining principles that are clarified in the model.

QUD models of discourse take it as a fundamental principle that conversational exchange is structured by questions which the interlocutors collaboratively try to answer. These questions may often be implicit but are principally retrievable or reconstructable. The conceptualization of discourse as a question-answer game goes back to at least Collingwood (1940, Reprint 1998), who states that every assertion is an answer to a question. The QUD model of discourse structure that I introduce here builds on Roberts (2012a,b) and Büring (2003). Questions serve as formal equivalents of (communicative) intentions of speakers to attain specific information. Gaining information proceeds by way of resolving a question that was mutually (but possibly tacitly) agreed upon and to make the answer common ground. Building on the insights of Stalnaker (1974b, 1978, 2014), discourse is conceived of as a communal inquiry of the interlocutors to investigate what the world is like, i.e. to investigate alternatives with the goal of understanding the way things are in the actual world. The QUD model spells
out a specific kind of contextual information – information about the discourse structure – that is part of the common ground information, interacts with it, but also guides how the informational exchange, and thereby the common ground itself, evolves or can evolve. The Gricean maxims have their counterparts in formal principles that constrain discourse structure as ‘metapresuppositions’ about discourse. A major feature of the QUD model is that these principles can be spelled out as semantic relations between questions.

(120) from Beaver and Velleman (2016) provides an example of a conversational exchange that is guided by posing questions and giving answers. Bold face font indicates that each contribution was an explicit move via an utterance of the respective interlocutor.

(120)  
(q1 Alice: How was the concert?  
(q2 Alice: . . . How was the sound?  
(a1 Bob: The sound was awful.))  
(q3 Alice: How was the band?  
(q4 Alice: . . . How was the drummer?  
(a2 Bob: Just fantastic.))  
(q5 Alice: . . . How was the singer?  
(a3 Bob: Better than ever.)))

It is easily observed that the questions posed by Alice are hierarchically structured. Her main intention is to learn about the overall quality of the concert. She then brakes down this ‘big’ issue into subissues and even subsubissues asking about specific aspects or properties of the concert (those properties that matter for her evaluation). Following Büring (2003), this hierarchical structure can be represented as a tree (a discourse tree or d-tree). Note that the hierarchical structure of discourse can also be represented with so-called stacks that are used by Roberts (2012b) a.o.3 The

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3 Beaver and Velleman (2016)[p. 93] note that D-trees are formally equivalent to QUD stacks under an additional constraint on D-trees that takes care of the dynamics.
latter representation better captures the dynamics of discourse, which I will make use of in section 4.4.2. However, d-trees are more comprehensible due to their visual character. Because of this illustrativeness I use them for introductory purposes.

(121) **D-tree representation**

```
How was the concert?
  |  
Was the sound good? | How was the band?
  |    |  
It was awful | How was the drummer? | How was the singer?
  |    |    |  
Just fantastic | Better than ever
```

The main idea of QUD models in the vein of Roberts (2012b) is that this kind of hierarchical structure is also present for discourses where the relevant questions are not explicitly given by an interlocutor. Bob could have given the monologue in (122).

(122) **Bob:** The sound at the concert was awful, but the drummer was fantastic and the singer was better than ever. (Beaver and Velleman 2016: 90)

The discourse structure that matches this utterance in monologic circumstances is almost the same as for its dialogue counterpart, except for the fact that for (123) the QUDs now are implicit, i.e. not uttered. This is indicated by non-bold font for the implicit parts of the discourse. With the utterance in (122) Bob is answering the very same question about the overall quality of the concert.

(123) \( (q_1 \text{ How was the concert?} \) 

\( (q_2 \ldots \text{How was the sound?} \)

\( (a_1 \text{ Bob: The sound at the concert was awful.}) \) 

\( (q_3 \text{ How was the band?} \)
(qa . . . How was the drummer?
  (arb: . . . but the drummer was fantastic,))
(qs . . . How was the singer?
  (arb: . . . and the singer was better than ever.)))

Though, Bob is here setting up the discourse structure all by himself and
the interpreter has to infer or accommodate (in the sense of Lewis (1979b))
the QUDs and their hierarchical structure. In contrast, in (120) the structure
is set up explicitly by Alice’s questions. It is one of the main achievements
of the QUD model that discourse principles and their link to linguistic
forms enable interpreters to infer the discourse structure. That participants
actively set up discourse structure by choosing specific forms for their
utterances is reflected in Büring’s (2003) terminology of calling discourse
trees and their substructures strategies. A strategy is a tree structure that
serves to answer a question at the root of the (sub-)tree. Where in (120)
Alice dictates the strategy, in (123) Bob chooses it by himself. He builds
on interpreters’ knowledge of the fundamental principles of discourse and
their respective ability to infer and accommodate QUD structure.

Tree structures for discourses like (121) arise from particular definitions
of how nodes and branches have to relate. Following Roberts (2012b)
discourse is a partially ordered set of moves. Nodes represent discourse
moves. There are two basic types of moves that advance discourse: setup
moves that serve to establish a new question under discussion (QUD) and
payoff moves that provide a partial or complete answer to the question
that the participants (oftentimes implicitly) agreed to solve. QUDs as well
as payoff moves are treated as semantic objects, i.e. question denotations
in the Hamblin framework. Semantically a QUD is a Hamblin set: the
set of its possible answers, a set of propositions. This set of propositions
need not be exhaustive and mutually exclusive, i.e. form a partition. But
partitions and Hamblin sets are closely related: each question gives rise
to a partition of Logical Space and, equivalently, the context set. Roberts
(2012b) calls this partition the q alternative-set of a question (q-alt(q)). The
semantic equivalents of payoff moves, i.e. answers, are propositions. In the
Hamblin picture these have to be represented as singleton sets, a set that contains only one set of worlds (a proposition). A payoff move provides a partial answer if and only if one of the alternatives in the partition is excluded relative to the context set. A complete answer selects exactly one open alternative.  

(124) Biezma and Goebel’s (2019) version

a. A partial answer to a question \( q \) is a proposition which contextually entails the evaluation – true or false – of at least one element of \( q\text{-alt}(q) \).

b. A complete answer is a proposition which contextually entails an evaluation – true or false – for each element of \( q\text{-alt}(q) \).

(125) a. Where is the captain?

b. He is not on the bridge.

c. He is in the galley.

For example, semantically the question in (125-a) denotes a set of propositions where each of these describes a place where the captain is. In context, a big amount of these places are ruled out, e.g. the captain is not on the moon. E.g. contextually the places to look for the captain may be restricted to places on the ship.  

Where (125-b) in (125) provides a partial answer, since only one possibility is ruled out, (125-c) provides a complete answer and resolves the constituent question.

4 Responses need not always be answers. E.g. participants can opt out and leave questions unanswered or agree that they are unanswerable. These kinds of moves are not (directly) captured in the framework. However, Farkas and Bruce (2010a) provide an account of moves of this kind that can be amalgamated with the QUD model, see e.g. Rawlins (2010).

5 Additionally, the question denotation in this case naturally forms a partition since the captain can only be at one place at once.
QUDs cannot only be addressed by resolving moves, i.e. assertions that either provide a partial or completed answer. This can also be done by raising a question that – in a sense to be spelled out – is about the current QUD. This is typically a question that is easier to resolve and helps to resolve the higher QUD. For a formal account of how a question can address a QUD, we need to scrutinize how questions are related in a discourse structure.

Following Groenendijk and Stokhof (1984, 1997) with the notions of answerhood (124) it is possible to formulate a logical notion of entailment between \( q \)-alternative sets, i.e. question denotations. Relations between moves in a discourse structure (or, equivalently, in a d-tree) build on these entailment relations and are used to formalize several constraints. In (126) I give a simplification of question entailment:

\[
(126) \quad Q \text{- entailment}
\]

A \( q \)-alternative set \( q_1 \) (contextually) entails \( q_2 \) iff every answer to \( q_2 \) is an answer to \( q_1 \). (Equivalently, each alternative of \( q_2 \) is an alternative in \( q_1 \).)

In general, a move has to address its dominating QUD somehow. As demonstrated, one can do this either by a partial or a complete answer or with an entailed question. But the definition of answerhood (124) also allows for addressing a question by making a move that contextually entails a partial or complete answer to the QUD. An example given in Simons et al. (2011) is answering the question ‘Is Avi old enough to drink?’ by asserting ‘He’s twenty-two.’ Under the assumption that the legal age for drinking in the relevant location is Common Ground amongst the discourse participants, the assertion entails an answer. Yet, it is crucial to understand, that interpreting ‘He’s twenty two’ as answering the question whether Avi is old enough to drink is mediated by the accommodation of an intermediate immediate QUD, i.e. ‘How old is Avi? What is Avi’s age?’ This is due to the
discourse principle of congruence that I will explain in due course. What has to be inferred by the addressee is how the question about Avi’s age helps to solve the question of whether he is old enough to drink. And this is done via contextual entailment.

What we can learn from this example is that the immediate QUD that dominates a move need not be identical to an (immediately) preceding question that is spelled out explicitly by an utterance of a question in discourse. This is especially significant for indirect answers to questions. What has to be inferred by the interpreter is typically a relation between the immediate, i.e. dominating QUD of an utterance – whose identification is guided by linguistic and contextual cues – and the explicit question in discourse.

Actually, the framework presented in chapter 3 spells out one kind of information, i.e. information about dependencies that leads to contextual entailment. Contextual entailment takes into account information that is not semantically encoded. The interpreters have to *pragmatically enrich* the information that is necessary to interpret an utterance and its immediate QUD relative to what was given in discourse already. This process can be quite complex. This dissertation can be seen as an (incomplete) attempt to spell out the process of pragmatic enrichment in *bc* and to clarify the different modules that are involved in this process. Sections 4.4.2 and 4.6 - 4.7 further elaborate on this issue.

The preceding discussions of answerhood and question entailment already implied that discourses are not mere agglomerations of moves. They are moves that are structured in a principled way. This structure is made explicit within the model by the formulation of constraints on which kind of move is licit at a certain point in discourse. The motivation for formulating such constraints on the structure of a discourse directly stem from Grice’s (1989) work. The moves that make up a discourse have to be coherent. And coherence can be spelled out by constraints on discourse structures via e.g. Q-entailment. Importantly, the constraints are to be used by interlocutors for triggering inferences and by interpreters to identify implicit QUDs. In Roberts (2004) discourse constraints are conceived
of as *metapresuppositions* that participants as rational agents mutually take for granted for the sake of communicative exchange. Metapresuppositions allow to capture the role of Grice’s maxims within the QUD model by giving information exchange a formal structure as well as explicating the underlying Stalnakerian conception of communication as a communal inquiry building and acting on mutually shared information.

Not only do discourse constraints hold for assertions as answers to QUDs but also for posing and, most importantly, for accommodating questions and strategies. The most central constraint is relevance. That a contribution to a conversation has to be relevant can be seen as a super-principle of communication.\(^6\)\(^7\) Intuitively a relevant move addresses a QUD in somehow being ‘about’ that QUD. There possibly are several precisifications of what relevance means.\(^8\) A major but somehow narrow explication is that a relevant assertion \(A\) addresses a QUD in either providing a partial or a complete answer. Similarly, a question or QUD \(q_2\) following or being related to a question/QUD \(q_1\) intuitively has to be relevant to the former question, i.e. it has to say something about \(q_1\). Roberts’s (2012) formalization of relevance as *Relevance in discourse* (127) directly builds on the definition of answerhood.

(127) *Relevance in discourse*\(^9\)

\(^6\) The fundamentality of relevance has also been argued for by so-called relevance theorists, e.g. Sperber and Wilson (1995). However, relevance theory never accomplished a definition, let alone a formalization of the notion of relevance. For an elaborated and concise criticism see Merin (1999). The lack of a definition might also be due to the reinterpretation of the Gricean project as giving a description of the processing of language. In contrast, the Gricean project may be rather characterized as the attempt of a rational reconstruction.

\(^7\) Flouting the principle of relevance is possible nevertheless. Giving an irrelevant response that the addressee cannot interpret as a relevant contribution amounts to opting out of a specific issue, topic or conversation.

\(^8\) Büring (2003) informally adds a dimension of probability weight. The work of Arthur Merin spells out this idea in an entirely decision theoretic, probabilistic setting that anticipates elements of the QUD framework, but offers an alternative perspective.

\(^9\) I will use the terms ‘Relevance’ and ‘Relevant’ with a capitalized ‘R’ in front to indicated that the definition is only a partial explication of the intuitive notion of conversational relevance.
a. An assertion $A$ is relevant with respect to a discourse structure iff $A$ is a partial or complete answer to the QUD of $A$

b. A question $Q$ is relevant with respect to a discourse structure iff at least one answer to $Q$ is an answer to the QUD of $Q$

(128)  

a. A: What do you want to eat for dinner?  
b. B: I want to eat rice bowl for dinner.  
c. B: It is such a nice morning today.

For example, (128-b) is a relevant answer to (128-a) since it constitutes a complete answer. In contrast, (128-c) is not relevant, since it neither directly nor via contextual entailment can be interpreted as an answer.10

Relevance (127) is the central constraint since it provides the glue to form a hierarchical structure out of a sequence of moves. This is since it builds on Q-entailment, i.e. higher questions in a d-tree q-entail lower questions.11 The principle of relevance guarantees coherence of discourse and requires that discourse participants only make relevant moves. This allows interpreters to identify the QUD that an utterance addresses and thereby to infer the intentions and goals of the speaker. The latter kind of inference will involve world knowledge which is especially important, since answers are not always direct but often have to be arrived at by some mechanism of pragmatic enrichment. Particularly, the basic assumption of the QUD model is that sentence-level meaning and discourse interact in several ways. The semantic meaning of a sentential expression allows to identify the QUD that is addressed, and, furthermore, with discursive principles to see how this relates to the strategy at this point of discourse. Roberts (2012b) puts it this way: “All that is given at the sentential level, conventionally, are certain sorts of presuppositions about the place and

---

10 Yet, (128-c) is a response relative to the discourse structure. The speaker is opting out, refusing to answer the immediate question and changing the topic. As pointed out above, these kinds of moves are not the topic of the current analysis.

11 Equally for stacks: questions on top are entailed by questions below.
function of the utterance in the information structure of the discourse in which it occurs.” [p. 2] A simple example is that the assertion ‘The captain is in the galley’ (125-c) by its conventional semantics is an answer to either the QUD ‘Where is the captain?’ or to ‘Who is in the galley?’.

Yet, discursive relevance is not the only principle that serves as a tool for interpreters to access discourse structure and speakers’ communicative intentions. Several constraints work together for this purpose. On the sentential level there are specific linguistic cues that function to indicate the addressed immediate QUD. These linguistic cues pertain to the information structure of a sentence. Krifka (2007) describes the information structure of an utterance as structural features that package the information that is conveyed with respect to different properties of what is to be conveyed. The QUD framework gives a general way of handling these phenomena in establishing a profound link between information structure and discourse structure. A most prominent example is the indication of focus by prosodic means. Following Rooth (1985, 1992) focus is a feature at the logical form (LF) of a sentential expression that generates alternatives to the proposition put forward by an assertive utterance. E.g. in the sentence ‘Jack ate the beans’, where ‘Jack’ is the focussed constituent, focus marking generates a set of alternative propositions {Johanna ate the beans, John ate the beans, Mark ate the beans, Maria ate the beans, etc.}. The second main discursive principle of congruence links this feature to discourse structure: the evoked alternatives have to be congruent with the current (possibly implicit) immediate QUD. That means that the alternatives evoked via focus have to coincide with the immediate QUD in discourse. Advocates of a pragmatic theory of focus interpretation like Beaver and Clark (2008) argue that the establishing of the link to discourse via congruence is indeed the sole function of focus marking, even though the effects may be quite variegated.

12 There certainly are further possible questions that this assertion can answer.
13 More on this issue is to be found e.g. in Beaver and Velleman (2016).
The linking of discourse structure and information structure is central for a comprehensive theory of focus. Within the QUD model focus marking turns into a tool for interpreters to identify the immediate QUD that an utterance tries to answer. Different information structures correlate to different QUDs as in (129) and (130).

(129)  
- a. [Jane]$_F$ brought the beans to the potluck.
- b. Jane [brought]$_F$ the beans to the potluck.
- c. Jane brought [the beans]$_F$ to the potluck.
- d. Jane brought the beans to[the potluck]$_F$.
- e. [Jane brought the beans to the potluck]$_F$.

(130)  
- a. Who brought the beans to the potluck?
- b. What did Jane do with the beans (with respect to the potluck)?
- c. What did Jane bring to the potluck?
- d. To what did Jane bring the beans?
- e. What happened (with respect to the potluck)?

In many cases, focus marking correlates to prosodic stress. Consider the examples in (131), where small caps indicate focussed constituents which are made prominent by prosodic stress.\footnote{Talking about prosody in this way is a simplification. For a detailed taxonomy of prosodic cues the reader is referred to the relevant linguistic literature. However, the simplification suffice for the purpose at hand.}

(131)  
$q_1$: Who plays soccer?  
- b. #John plays soccer.
The latter assertion (131-b) is not congruent since it is – by its alternative structure via focus – to be interpreted as an answer to a question regarding what John plays. Congruence is a consequence of (126) that is reflected also in the principle of Relevance. Generally only moves that ‘fit’ the alternative structure of the immediate QUD are licit moves.  

Note that without explicit focus marking the sentence (131-a) John plays soccer may answer a whole variety of questions, also depending on whether there is narrow focus or broad focus. For the former, focus takes scope over a constituent of the sentence as in (131-a) or (131-b). When focus takes broad scope, the generated alternatives are on the propositional level, i.e. the whole sentence can be in focus. A congruent QUD to such an utterance is e.g. What is happening?. Hence, one sentence can have several focus structures.

Selkirk (1995) points out that sentences that are pronounced identically can have different focus structure as in (132). This means that the mapping of prosody and focus structure is not simply one-to-one.

(132) (Beaver and Velleman 2016: 91)
   a. Mary wrote a book about bats
   b. Mary wrote a book about \([\text{bats}]_F\)
   c. Mary wrote a book [about bats]_F
   d. Mary wrote [a book about bats]_F
   e. Mary [wrote a book about [bats]_F
   f. [Mary wrote a book about [bats]_F

The QUD account of information structure provides a solution to this problem. Interpreters figure out the information structure of an utterance by using their knowledge about the discourse principles, what was uttered in previous discourse, and about how linguistic cues like prosody constrain

\[^{15}\text{Beaver and Velleman (2016) additionally invoke availability constraints which “determine which points in the tree can have children attached to them at any given moment in the disourse.” [p.94] I will not go into this issue here, but I take it that a principle like this might be implemented into the other principles. How fine-grained the formulation of the constraints has to be will also be guided by the phenomenon that one is to explain with these discourse structures.}\]
what is possible as an immediate QUD. Beaver and Velleman (2016) put it this way: “[W]hen we hear a sentence whose information structure is ambiguous, we choose the structure which leads to the fewest constraint violations and the least need for accommodation or repair.” [p. 91]

With the QUD approach to focus we can also claim that there is always focus marking in a sentence. Interpreters beliefs about discourse structure and information structure are interdependent, since information structure helps to figure out discourse structure, but also the other way around. Prosodic as well as syntactic and lexical means constrain the search space for the ‘right’ QUD and serve interpreters to identify it.

With this the principle of congruence as well plays a role for indirect answers and contextual entailment in discourse. (133-b) is not a congruent move with respect to the question (133-a).

(133) a. A: Are you coming to the party?
   b. B: I have a meeting with my working group.

Hence, the interpreter accommodates an immediate QUD for (133-b) along the lines of What is B doing (the night of the party)? Via the principle of relevance the interpreter has to build a relevant relation between the accommodated and the explicit question by using her world knowledge. The answers to the second question in the end evaluate the alternatives of the explicit question and it is inferred that a negative answer is given. This underlines that a preceding explicit question does not need to provide the immediate QUD to a subsequent utterance. Discourse principles may force e.g. to accommodate an intermediate QUD plus pragmatic enrichment.

On the basis of the discourse principles of Relevance and especially congruence the QUD model allows to draw a quite precise line between the main point of an utterance, the so-called at-issue content, and information that is in the background, the not-at-issue component. In a nutshell, the basic idea is that the information carried by an utterance that provides the answer to the immediate QUD is the at-issue content. All other information is not-at-issue.
Language provides multiple ways of marking not-at-issue content by specific linguistic means, syntactically, lexically or even semantically. E.g. a sentence like (134) has as its not-at-issue content that Jack does not like to drive. But the at-issue content that answers the QUD *What is Jack doing?* is that he is driving to the airport.

(134) Jack, who doesn’t like to drive cars, is driving to the airport.

Consequently, Simons et al. (2011) define at-issueness of a proposition with respect to (i) the immediate QUD and (ii) the intention of the speaker to address the QUD.

(135) Definition of at-issueness (Simons et al. 2011: 323)

a. For any proposition $p$, let $?p$ denote the question ‘whether $p$’, i.e. the partition on the set of worlds with members $p$ and $\neg p$.

b. A proposition $p$ is at-issue iff the speaker intends to address the QUD via $?p$.

c. An intention to address the QUD via $?p$ is felicitous only if:
   (i) $?p$ is relevant to the QUD, and
   (ii) the speaker can reasonably expect the addressee to recognize this intention.

What is important for the analysis of *if*-constructions is that with this definition a link between the information structure of a sentence and at-issueness is established. E.g. what is focussed is typically at-issue because of the congruence principle for focus. The QUD and the intentions of the speaker determine what is at-issue. The intentions of the speaker are constrained by discourse principles such as relevance, congruence and by the fact that the speaker’s intention has to be identifiable by the addressee.
Information structure then is essential for identifying the QUD. If the QUD is settled, i.e. figured out by the interpreter and mutually accepted by the discourse participants, it is also settled what is at-issue. The QUD is partly given by focus structure. The interpreter identifies what is at-issue mainly by identifying the focus and using the principle of congruence.

One case where the QUD account of at-issueness provides explanatory insights is the projection behavior of certain presuppositions. The major claim is that only not-at-issue content, i.e. information that does not pertain to the immediate QUD, projects. Note that Simons et al. (2011) suggest that presuppositions are only one kind of not-at-issue content, i.e. projective content. Other kinds of not-at-issue content compromise phenomena that were filed under conventional implicatures etc. Consequently they propose to re-taxonomize not-at-issue content with respect to its respective projection behavior.

Presupposition projection is the phenomenon that the presupposition that is triggered by e.g. a specific lexical item is standardly also in place when the item occurs in embedded contexts. One example invoked by Beaver and Velleman (2016) is the cognitive factive verb *discover*. It standardly gives rise to the factive presupposition that what was discovered is taken to be true.

(136) The T.A. discovered that your work is plagiarized.

(136) gives rise to the presupposition that the addressee’s work is in fact plagiarized, i.e. the complement *your work is plagiarized* is presupposed. Karttunen (1971) observed the puzzle that this presupposition does not project uniformly. Beaver (2010) claims that one has to take into account information structure to account for this issue. Compare the following cases (from Beaver and Velleman (2016)).

(137) a. If I discover that your work is [plagiarized]$_F$, I will be [forced to notify the Dean]$_F$.

b. If the T.A. discovers that your work is [plagiarized]$_F$, I will be [forced to notify the Dean]$_F$. 

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c. If the T.A. [discovers]$_f$ that your work is plagiarized, I will be [forced to notify the Dean]$_f$.

Neither in (137-a) nor in (137-b) the presupposition projects. But in (137-c) it does. The QUD account provides an explanation along the following lines. In (137-c) focus on *discovers* (indicated by stress) indicates that the QUD is about whether something has been discovered or not. What has been discovered is not-at-issue and hence projects. For the other two cases, (137-a) and (137-b) it is rather the case that the QUD will be about what will be discovered. And this may leave it open that the work is *not* plagiarized. Hence, the complement – that the work is plagiarized – is at-issue and does not project.

Though projection behavior will not play a role in the following, the examples make clear how we have to conceive of at-issueness and how information structure and discourse structure interact. Understanding this interaction is crucial for the discourse account of *if*-constructions in section 4.2.

In this section I have introduced the basics of the QUD model of discourse. This model conceives of discourse as a hierarchical structure guided by questions and structured by (entailment) relations between questions. Discourse principles constrain what counts as a felicitous move in discourse, the most important principles being relevance and congruence.

### 4.2 Information structure and *if*-constructions

In this section I present the basic account of the discursive function of *if*-constructions from Biezma and Goebel (2016, 2019). Their major claim is that *if*-constructions feature a specific information structure and constitute complex discourse moves on the the level of discourse structure. This account is opposed to e.g. Ippolito’s (2016) take on the discourse mapping of *if*-constructions where an *if*-construction is conceived as a basic, non-complex kind of discourse move.
Accounting for the discursive function of an *if*-constructions in this way allows for a general explanation of how the overall meaning of a *bc* is generated by taking into account discourse principles. With contextual entailment as a way to establish relevance, the framework from chapter 3 comes into the picture: the assumption of independence *blocks* one way to establish relevance, so that the interpreter has to search for other ways to make the move(s) made with a *bc* felicitous.

But let’s start with the basics. Following Haiman (1978) it has repeatedly been argued that *if*-constructions depict a particular information structure where the *if*-clause provides the *topic* of the utterance. In contrast, the consequent provides information *about* this topic. In light of standard semantic accounts of *if*-constructions – static or dynamic –, this take on their information structure and the asymmetry between antecedent and consequent with respect to information structure is quite plausible. This is due to the quantificational nature of *if*-constructions. In almost all accounts *if*-constructions are conceived of as universal quantifications over a restricted set of possible worlds. This makes (bare) *if*-constructions modal constructions where the *if*-clause acts as a restrictor on a modal domain. The consequent makes a universal claim about all worlds in the so-restricted domain. That the *if*-clause acts as a restrictor naturally parallels the topic-introducing role of the antecedent of an *if*-construction.

The QUD model of discourse provides a concise account of the notion of a (sentential) topic. The topic of a sentence, i.e. what it is about, is given by the QUD it provides an answer to. The semantics of *if*-constructions, their specific form, provides a key ingredient to their discursive role. On the assumption that the antecedent (the *if*-clause) provides the topic of the *if*-construction in question, it thereby provides the QUD, where the consequent provides the answer. This means that the semantics map to a particular discourse structure which is special in the sense that as well as explicitly setting up a QUD the speaker also instantaneously provides an
answer to the question she chose to set up. \textit{If}-constructions accordingly map to micro discourses that comprise two moves and hence provide a (partial) strategy on the discourse level. We can say that \textit{if}-constructions are complex moves.

How to capture the QUD that the antecedent of an \textit{if}-construction sets up? The antecedent QUD asks about what is true at the antecedent worlds and the consequent gives an answer to this question. A possible characterization of the antecedent QUD then is ‘\textit{What is the case at the antecedent worlds?}’ or ‘\textit{What is true at the antecedent worlds}’.\textsuperscript{16} The intuitive natural language equivalent of those questions are \textit{What if}-questions (or WIFs for short), i.e. ‘\textit{What if the antecedent is true}?’. In section 4.4.1 I spell out WIF-QUDs more formally, but for now I will use this intuitive WIF equivalent for the antecedent QUD. An \textit{if}-construction ‘\textit{if } p, \textit{q}’ accordingly is mapped to the discourse structure ‘\textit{What if } p? – \textit{q}’.

\begin{center}
\begin{tabular}{|c|c|}
\hline
If you are hungry, there are biscuits on the sideboard & Discourse mapping \\
\hline
QUD: What is the case if the addressee is hungry? \\
Answer: There are biscuits on the sideboard. \\
\hline
\end{tabular}
\end{center}

The QUD ‘\textit{What is the case if } p?’ is declaredly vague. Though, there is the consequent that guides interpretation to what the relevant aspects of the suppositional context are that the speaker is interested in. Biezma and Goebel (2019) point out that the mechanism at play here is the same like in sequences of questions where the main question is underspecified but the subquestions elucidate which aspects the speaker is interested in.

(138) A: How was your date?
   a. A: Was the food good?

\textsuperscript{16} Which antecedent worlds are referred to is different in indicative and subjunctive \textit{if}-constructions. For the former, it is asked about the antecedent worlds in the context set, see Stalnaker (2014) and Williams (2008). For subjunctive \textit{if}-constructions the domain of antecedent worlds will be selected differently, e.g. by a closeness relation of possible worlds or a similar ordering.
b. A’: Is she an intelligent woman?

Where (138-a) indicates that the speaker is interested in aspects about the settings of the date, e.g. the food, the restaurant, which bar they went to after dinner etc., (138-b) indicates that the speaker is interested about the properties of the dated person and which feelings were involved. Similarly, in a bc the consequent is interpreted as specifying those aspects.\(^{17}\)

Crucially, the discourse mapping of if-constructions is bound to their information structure. Somewhat simplified, the antecedent provides the topic and the consequent is focussed. With this we can also claim that the content of the antecedent is *not-at-issue* whereas the consequent is the at-issue meaning component. By identifying the relevant aspects of the suppositional context, the interpreter then ensures that the principle of congruence that links information structure and discourse structure is met. Conversely, by the discourse mapping, the interpreter knows that the consequent has to be a congruent answer to the suppositional question that is indicated with the antecedent. I.e. the consequent has to be interpreted as *evaluating* the alternatives that are proffered by the suppositional question. However, particularly in bcs what the structure of the alternatives is has to be inferred. For 'If you are hungry, there are biscuits' it has to be inferred that it is not generally what things are there which is relevant in the suppositional context, but which food is there that can be used to ease the hunger. In section 4.4.2 I take a closer look at one kind of specific mechanism that allows to interpret the consequent in a bc as a relevant and congruent answer to the suppositional question set up with the antecedent on the discourse level.

Crucially, it is the semantics that guides how the discourse structure is build. Though (139) gives rise to the same inferences like (140), the mapping is *different*. (140-b) *by its semantics* and information structural features necessarily involves a suppositional QUD. The discourse principles that guide the identification of the QUD then set in in this restricted setting.

\(^{17}\) With Lewis (1988) related aspects could be grouped into a specific partition that Lewis terms subject matter. Subject matters may be understood as formal representations of conceptual schemes.
(139)  A:  I am hungry.
      B:  There are biscuits on the sideboard.
          \(\leadsto\) suggestion to eat the biscuits

(140)  a.  A:  What if I am hungry?
      B:  There are biscuits on the sideboard.
          \(\leadsto\) suggestion to eat the biscuits

      b.  If you are hungry there are biscuits on the sideboard.
          \(\leadsto\) suggestion to eat the biscuits

As already noted, there is a parallel between the semantic function of
the antecedent as a restrictor for modal quantification and its discursive
function of setting up a QUD. It is argued in Jäger (2007) a.o. that QUDs
in general serve as restrictors when interacting with a quantificational
answer as exemplified in (141). In the cases discussed by Jäger (2007)
quantification is not modal, i.e. over possible worlds, but over individuals.
The hypothesis that underlies the discourse account of \textit{if}-constructions is
that the observations carry over to modal quantification as well.

(141)  a.  Who is wise? Only Socrates is wise.

      b.  Which Athenians are wise? Only Socrates is wise.

The meaning of \textit{only} \textit{s} is \textit{P} could be captured by a quantificational formula
like \(\forall x(P(x) \rightarrow x = s)\).\textsuperscript{18} Where the domain of quantification in (141-a)
is left unrestricted by the QUD, the QUD in (141-b) contains a restriction
such that the respective formula is of the following form: \(\forall x(\text{athenian}(x) \land \text{wise}(x) \rightarrow x = s)\). Hence, the specific discourse function of the antecedent
in an \textit{if}-construction is not that special, but derives from the interaction
of quantification and discourse structure. Albeit, what is really different
in \textit{if}-constructions is that with the linguistic form the restriction on the
semantic as well as on the discourse level gets spelled out explicitly, i.e.
linguistic form makes discourse structure explicit.

\textsuperscript{18} This is a simplifying assumption. See e.g. Beaver and Clark (2008) for arguments why
such an account falls short of accounting for the phenomena involving ‘only’.
The parallel to ‘standard’ quantification teaches an important lesson about how to conceive of the discourse mapping behavior of if-constructions. By what was said by now, it suggests itself that there is only one mapping to discourse, i.e. the antecedent providing the topical QUD. This would mean that the antecedent mapping is most probably a discourse constraint from conventional meaning. Ebert et al. (2014) a.o. indeed semanticize the discourse mapping in this way. However, this cannot be right. Consider the following examples involving standard universal quantification over individuals.

(142)  
a. Which property do all children have (in common)? All children are tired.  
b. Who is tired? All children are tired.

In (142-a) it is the property ‘being tired’ that provides the answering, i.e. the focused constituent. That it is all children is not-at-issue here, because this information is given by the QUD. Hence, the quantificational phrase is to be conceived of as topical, i.e. backgrounded. This is analogous to the antecedent mapping of if-constructions where it is claimed that all antecedent worlds are such that the consequent is true at them. In contrast, the direction of the relation is reversed in (142-b). Here, the quantificational phrase provides the answering constituent whereas the predication of a property is topical and not-at-issue. The latter phenomenon of reversal carries over to if-constructions as quantificational structures. As for the sentence ‘All children are tired’ where a property is predicated of all the children, in if-constructions the consequent provides a ‘property’ of all antecedent worlds, i.e. that the consequent clause is true at them, or equivalently that all the antecedent worlds are a subset of the consequent proposition. But as for the examples with quantification over individuals in (142), in if-constructions the speaker

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19 It seems that also Starr (2014b) does semanticize the antecedent mapping, though I am not sure about this.  
20 In terms of the semantic meaning of the respective QUDs, (142-a) and (142-b) represent different alternatives to choose between.
may either aim to give information on the antecedent worlds, i.e. that in all of them the consequent is true, or, she may aim to give information on (some of) the consequent worlds, i.e. that the antecedent is one way to establish the truth of the consequent. In the latter case the information structure of the *if*-construction is reversed. The fact that in *if*-constructions either the antecedent or the consequent are topical and provide the QUD for the sentence is observed in von Fintel (2001, 2009) and Biezma (2011).

(143) If you mow the lawn, I give you five dollars.
    A: Under which circumstances do you give me five dollars?
    B: If you mow the lawn.

Paraphrases for this kind of discourse mapping of *if*-constructions are given in (144).

(144) *if p, q*
    a. Under which circumstances *q*?
    b. Under which circumstances is *q* true?
    c. When *q*?

Though it is not clear and a subject for further research what determines the direction of information structure in *if*-constructions, it is clear from (144) that the discourse structure in *if*-constructions can be reversed. Contextual factors and overall discourse structure, i.e. the QUD that the immediate QUD of the *if*-construction is attached to, might further determine possible reversal of information structure.\(^{21}\) One factor that is identified in Biezma (2011) responsible for such a reversal is the presence of a focus particle like *only* attached to the antecedent which makes the consequent topical.\(^{22}\) Still, as is evident from the literature on topicality in *if*-constructions there is a strong tendency of interpreters – especially

\(^{21}\) It is not always easy to identify which mapping is given, since discourse participants are naturally prone to accommodate topics/QUDs when they somehow fit into the current discourse.

\(^{22}\) I.e. when we have ‘if only ...’ or ‘only if ...’.
if there is no explicit context provided – to conceive of the information structure of an if-construction as an antecedent mapping. Hence, the hypothesis that I adopt from Biezma and Goebel (2019) is that the antecedent mapping is the default, non-marked case for if-constructions.

Importantly, the reversed consequent mapping of an if-construction is not possible in bc readings. Consider the following example.

(145)  A: When are there biscuits on the sideboard?
       B: #If you are hungry, there are biscuits on the sideboard.

The only way to make sense of (145) is to understand the conditionalized answer as an hc where biscuits appear on the condition that the addressee is hungry.23 However, if the answer is to be interpreted as a bc, i.e. if there is a contextual assumption of factual independence between antecedent and consequent, the hc reading is not available, and hence the bc cannot provide an answer to the question about the consequent.

Biezma and Goebel’s (2019) explanation builds on the definitional property of bc readings together with assumptions about discourse reasoning and discourse manner.24 A more technical paraphrase of the consequent QUD that highlights the relation to the semantics of the if-construction is ‘what are the propositions p such that for all selected worlds in which p is true, q is true?’ Hence, what a consequent QUD asks for are those propositions that are subsets of q. Asking an ‘Under which circumstances’-question amounts to aiming to learn which parts of the context set are such that there are biscuits on the sideboard. And for this it is important to know whether the biscuits are there, no matter what, i.e. in all worlds of the context set there are biscuits, or, that there are biscuits only under specific conditions.

23 Note that on the pragmatic account presented here, such a reading might be available if there is no shared contextual assumption of factual independence. However, this depends on the model that the interpreter builds for the utterance situation. See chapter 3, 3.4.3.

24 On the notion of discourse manner see Biezma and Arregui (2016).
Semantically the interpreter learns from (145) that all the worlds where the antecedent is true are consequent worlds. On the assumption that the *if*-construction is a BC, additionally, with the contextual assumption of factual independence by the pragmatic inference modeled in chapter 3, she also learns that the consequent is true with respect to the entire context set.

With the overall update of the context set being equivalent with an update with the consequent proposition, for the interpreter the question arises why the speaker has used the form of an *if*-construction where CE is arrived at by a complex inferential process. The global update with the consequent proposition could have been arrived at by the straightforward assertion of the consequent alone without this much computational effort. CE in BCs is a complex process with computational costs where unconditionality is conveyed indirectly. In the case of answering a consequent QUD ‘*Under which circumstances q?’ via a BC, these costs of processing the *if*-construction towards CE are not justified if the single purpose of the strengthening process is CE. Answering with a BC in (145) violates discourse manners and hence is infelicitous. This kind of explanation hinges on a principle that Biezma et al. (2013) term ‘Principle of pragmatic economy’ (146).

(146) **Principle of pragmatic economy**
Use the simplest and most informative utterance available.

In (145) the information in the restricting but factually independent antecedent that sets up the suppositional context where the addressee is hungry does not and cannot play a role in resolving the consequent topic.

However, it is difficult to pin down and give a rational reconstruction of the infelicity in (145) without a worked-out formal account of the QUD in case of the consequent being topical. But such an account is not available and left for future research. What is not clear on the explanation of Biezma and Goebel (2019) about the blocking of the reversed mapping is why the interpreter cannot construct an explanation to why the discourse was set
up with a consequent QUD. Their explanation furthermore hinges on the fact that a less complex way of giving the information that the consequent is true unconditionally is available, i.e. an outright assertion. But, even such an outright assertion as an answer (with a supposedly simpler form) to a consequent QUD seems to be infelicitous or at least uninformative, too, as witnessed by (147).

(147) A: Under which circumstances are there biscuits on the sideboard?
B: ??There are biscuits on the sideboard.

It seems that already the (form of the) QUD triggers the inference or presupposition that there being biscuits is not assumed to be true unconditionally. Indeed, if we assume that consequent QUDs require that their answers are suppositional, B’s answer in (147) is not a congruent answer to the question, since it doesn’t feature a suppositional element. Supposedly, the semantics of a consequent QUD might require that only suppositions are licit answers. The answer in (147) just takes up the topical proposition and thereby may be infelicitous. What has to be explained then is why this kind of question or QUD gives rise to such an inference and how this explanation is linked to the account of Biezma and Goebel (2019).

A related problem is that out of context the natural language question in (147) is rather interpreted as referring to a generalization, i.e. something along the lines of ‘what are the circumstances in general under which there are biscuits on the sideboard?’ . This reading aims at the issue of how to make or how it came about that there are biscuits. But an indicative if-construction in context aims at finding out whether the (topical) consequent is true or not (right now). This is then rather a particularized interpretation. Natural language paraphrases cannot capture these differences sufficiently,
so that the help of extra-linguistic context is needed. But it is not clear what these contextual features are. The temporal constellation might play a role. In (148) for example the answer seems to be felicitious if the temporal dimension is made explicit.25

(148)  A: Under which circumstances are there biscuits on the sideboard?
B: There (just) are biscuits on the sideboard right now.

Though, at this point there is no comprehensive explanation, it is still established that bcs do not allow for a discourse mapping that asks for possible suppositions that assure the consequent being true. A comprehensive account has to settle a precise account of the workings of consequent QUDs.

One conclusion from the observations given here is that consequent mappings of if-constructions always give rise to \(hc\) readings. But importantly, antecedent mappings of the ‘What if ...?’ kind can give rise to both, \(hc\) and \(bc\) readings. Following Biezma and Goebel (2019) the differences between these interpretations are due to the same general features, i.e. discourse mapping and the principle of pragmatic economy that figured prominently in the explanation of the blocking of reversal mappings in bcs.

In this section I have presented Biezma and Goebel’s (2019) idea of the discourse mapping of if-constructions within the QUD paradigm. By default the information structure of if-constructions maps to a discourse structure where the antecedent sets up a suppositional ‘What if ...?’ question and the consequent provides an answer to that question. However, in part due to the quantificational character of if-constructions, the mapping can be reversed so that the consequent provides the topical QUD. With this reversal it is borne out that the discourse mapping cannot be a semantic feature of an if-construction, but is determined by contextual and information structural factors. Though, it is not entirely clear which features are responsible for a reversal, it can be observed that reversal is blocked in

25 However, we might also want to draw a line between a temporal and a hypothetical interpretation of e.g. a ‘when?’ question, which seems to collapse on this line of argument.
a bc reading of an if-construction. The major responsible factor is the assumption of factual independence. Part of the explanation of why factual independence blocks reversal is discourse manners and the violation of the principle of pragmatic economy. A comprehensive explanation, though, is needed for a detailed account of consequent QUDs which cannot be given here.

4.3 Inferences from discourse mappings and reasoning about form

On the discourse level if-constructions are complex discourse moves where – by default – the antecedent sets up a suppositional QUD that the consequent answers. Building on this account of the discursive role of if-constructions Biezma and Goebel (2019) establish that the different flavors of if-constructions – hc readings or bc readings – are both to be conceived of as inferences from the information structural mapping of if-constructions that results from their form together with the contextual information about dependencies or independencies. Discourse mappings of if-constructions where the antecedent provides the suppositional QUD give rise to hc (149-a) as well as bc readings (149-c). This is borne out when the antecedent QUD is made explicit in distributed cases in (149-b) and (149-d).

(149) a. If you drop this vase, it breaks.
    \[\rightarrow\] Speaker indicates that there is a causal/dependence relation between dropping the vase and its breaking; the breaking is a consequence of the dropping

b. A: What if I drop this vase?
   B: It breaks.

c. If you are hungry, there are biscuits on the sideboard.
    \[\rightarrow\] Speaker suggests to take the biscuits and eat them to ease the hunger
d. A: What if I am hungry?
   B: There are biscuits on the sideboard.

Whether the respective if-construction receives a reading as an hc or bc is triggered by discursive relevance. In particular, it is due to the ways of building relevance, i.e. conceiving the consequent as an answer to the antecedent QUD, that are available to the interpreter. In each case – either where the discourse structure is indicated by the information structure of the if-construction or explicitly given – the interpreter has to conceive of the answer (in the if-construction form, the consequent) as discursively relevant to the issue brought up by the antecedent. This is forced by the constraining principle of Relevance (127). The way how the consequent can be understood as an answer differentiates hc readings from bc readings.

As argued in chapter 3, an hc reading arises if (and only if) the shared assumptions about the dependencies between the facts in question (and thereby the respective propositions) are compatible with a dependence. It is this possible dependence that allows the interpreter to retrieve why the consequent is a relevant answer: all the antecedent worlds are consequent worlds because the truth of the consequent depends on the truth of the antecedent. In case of (149-a) and (149-b) the dependence relation is causal (but this needn’t be the only sort of relation: there is also e.g. analytical dependence a.o.). Put more concisely, the antecedent can be understood as making the consequent true, because the information given in the antecedent is causal-explanatory for the consequent being true. Biezma (2014) argues that ‘then’ as a discourse particle conventionally forces such an explanatory relation. In the case of ‘then’-less hc readings this relation is the easiest available relation between antecedent and consequent that allows the interpreter to conceive of the consequent as a relevant answer to the

26 However, note that compatibility with a dependence also allows for an update resulting in independence being established. Still, then, we here have an hc reading of an if-construction: If something is learned about the web of dependencies – be it dependence or independence – the reading is an hc reading. If independence is a contextual assumption prior to the utterance of an if-construction with the respective content, typically a bc reading results.

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suppositional QUd from the antecedent. This in turn is facilitated by the compatibility of the extended context set with such a relation. Inferring an explanatory relation spells out what contextual entailment means in these contextual circumstances. The notion of a causal explanation used in Biezma (2014) is taken from Lewis (1986). It comes in handy here to account for the causal character of the relation between antecedent and consequent in (149-a). Certainly, neither do the hypothetical ‘event’ that is described in the antecedent provide an actual cause for the event described in the consequent, nor can a proposition stand in a causal relation to another proposition. However, propositions as information carriers can be part of causal explanations in the sense of Lewis (1986) and Beebee (2004). In a causal explanation information about the causal history of an event is given. Lewis (1986) and Beebee (2004) emphasize that a causal explanation does not even need to give information about the actual cause of an event. It only has to give sufficient information about the causal history of this event, e.g. in the case of mentioning the omission of an intervention (‘If nobody helps, the children starve to death.’). For example in (149-a) the antecedent provides hypothetical explanatory information about a possible event of the vase’s breaking. In (149-b) it is asked about the consequences if the supposition of dropping the vase was true. The answer is interpreted as a causal consequence. This can only be if the antecedent in turn is interpreted as providing causal explanatory information. A similar, more formalized, though semanticized perspective on the causal flavor of counterfactual if-constructions is presented in Snider and Bjorndahl (2015). It is claimed that antecedents of counterfactual if-constructions are interpreted as causal explanations within a causal model theory following Pearl (2000). In contrast, on the account presented here, this kind of information and the respective causal explanation is retrieved pragmatically from the information in the extended context set (with a dependence structure) triggered by discourse structure.\textsuperscript{27} Snider and Bjorndahl (2015) rightly note that the dependencies in hcs do not have to be direct: They can convey a cor-

\textsuperscript{27} I already mentioned that one might want to modify the model of dependence and independence given in chapter 3 to one explicitly using causal models.
relation that allows the interpreter to infer a common cause or a complex causal pattern. E.g. in ‘If the barometer rises, it will be nice weather’ the common cause might be considered the quantity of air pressure. Furthermore, dependencies do not have to have causal character. Generally, I suggest to think of these relations as explanatory relations of some kind that make use of the notion of a dependence as broadly as conceived by Veltman (2005).28

With a representation of the dependence structures in the context set, the consequent in an hc reading is understood as an answer to the suppositional QUD via contextual entailment/pragmatic enrichment by taking into account world knowledge that is assumed to be shared amongst the discourse participants. The claim in (127) is that a discourse move is relevant if it selects (or, in case of a partial answer, at least helps to select) one of the alternatives proffered by the immediate QUD. In the case of example (149-a) the consequent indicates that the alternatives available in the QUD at least comprise that the vase breaks and its complement that the vase does not break. The inference of dependence or explanation if it is available via dependence compatibility, allows even more assumptions about the structure of the alternatives, i.e. that in (live) worlds where the antecedent is not true, there is also the possibility that the consequent is not true.

4.3.1 Reasoning about form and complexity

Reasoning from the dependence structure in the context set towards establishing a dependence is triggered by the form of an if-construction and its discourse mapping. Reasoning about dependence allows the interpreter to find a reason why the speaker chose to use the linguistic form of an if-construction, i.e. why the speaker makes a restricted claim, and with this chose to set up a certain discourse structure. In the case of an hc

28 However, Veltman’s (2005) formal representation has some major drawbacks. In the end one might want to represent dependencies by directed graph structures possibly allowing for cyclicity.
interpretation the compatibility of a dependence with the shared information about dependencies makes such an explanation available and even required. This is also due to the principle of pragmatic economy that is used in 4.2 and is repeated for convenience as (150) below.

(150) **Principle of pragmatic economy**

Use the simplest and most informative utterance available.

If the speaker of (149-a) intended to convey that the vase breaks anyway, independently of its being dropped or not, the more simple form would have been an outright declarative assertion of the consequent proposition. The possibility of a dependence relation, indeed of a causal explanatory relation, between antecedent and consequent in (149-a) provides a reason for why the suppositional restriction was put in place.

Lauer (2013, 2014) elaborates on this phenomenon and terms this kind of reasoning *Need a Reason*-reasoning that gives rise to mandatory implicatures. These implicatures are different from standard Gricean implicatures in not being optional or cancelable. In a way, this runs against the canonical account of implicatures, since optionality and cancellability are taken to be key features of any pragmatic inference that is taken to be a conversational implicature. In contrast, mandatory implicatures arise on every occasion of use due to their specific form. Importantly, these mandatory implicatures are not due to logical contrast. E.g. in standard scalar implicatures, the higher on the pragmatic scale an item is, the higher its informativity. It was argued in von Fintel (2001, 2009) a.o. that *if*-constructions give rise to such standard scalar implicatures building on informativity (or quantity). He argues that an *if*-construction competes with the unconditional form of the consequent due to the higher informativity of the unconditional utterance of the consequent. With Lauer (2014) and Biezma et al. (2013) I claim, that, especially with respect to *if*-constructions, this competition is not for every case traced to informativity. A second level is computational complexity that concerns how much inferences the use of a specific form triggers and
how much effort the interpreter has to put into the interpretation of an utterance. This difference between the informational and the processing level is especially relevant for the interpretation of bcs, since on the overall informational level bcs are equivalent to the unconditional form.

Where Biezma et al. (2013) are directly concerned with particular subjunctive if-constructions, Lauer’s (2014) main example for what he calls a mandatory implicature is the so-called ignorance implicature of disjunction. The standard description of this inference is that a speaker uttering a disjunction ‘A or B’ implicates that she does not know which of the two, A or B, is true. This looks like an implicature from the maxim of quantity: If the speaker had known which of the disjuncts is true, there were logically stronger expressions to express this thereby providing more relevant information. In particular, the assertion of the true disjunct – or the conjunction if both were true – would have been the way to go. Hence, the inference partly rests on the possibility of using logically stronger expressions. At least, this is the standard way to account for this phenomenon as a standard conversational implicature.

But Lauer (2014) goes on to show that the ignorance implicature is different from standard quantity implicatures. Such a standard quantity implicature is presented in (151-b).

(151)  
  a.  Ad: Where is Jane? I need to track her down.  
  b.  Sp: She is in Europe.  
      \sim Sp does not know where in Europe Jane is.  
  c.  Sp: She is in Paris or in London.  
      \sim Sp does not know that Jane is in Paris.  
      \sim Sp does not know that Jane is in London.
In this context it looks as if the inferences in (151-b) and (151-c) are of the same kind: The speaker just cannot give more specific information about the whereabouts of Jane. As standard quantity implicatures we would expect that in different contexts these implicatures go away, i.e. standard conversational implicatures are supposed to be cancelable. As will get clear from (152) this is only possible for (151-b) but not for (151-c).

(152) [Somewhere in San Francisco Ad and Sp are planning a dinner party, talking about who they should invite.] (adapted from Lauer 2014: 22)
   a. Ad: Is Jane in town?
   b. No, she is in Europe.
   c. No, she is in Paris or in London.
      \(\sim Sp\) does not know that Jane is in Paris.
      \(\sim Sp\) does not know that Jane is in London.

(152) presents a context where considerations of relevance prevent the presence of the ignorance implicature in (152-b). The exact whereabouts of Jane are just irrelevant for the planning: Either she is in town or not. The speaker of (152-b) might well know where exactly Jane is, but this is irrelevant for the issue at hand. Hence, just from the utterance of (152-b) the hearer is not justified in inferring that the speaker does not know the exact travel destination of Jane.

But things are different with (152-c). If the ignorance implicature of disjunction was just a standard conversational implicature, we would expect it not to arise in this context as well. I.e. the speaker would be expected to being able to utter (152-c) without signalling that she does not know where exactly Jane is. In contrast, even though the exact whereabouts are not relevant, the ignorance inferences still arise in (152-c) with the use of a disjunction.

In Lauer (2013) it is indeed shown that the ignorance implicature of disjunction is not cancelable. Going back to (151), for (151-b) the ignorance implicature is cancelable by the speaker e.g. with (153).
Jane is in Europe. In fact, she is in Paris.

But with the disjunction, this is not possible or at least quite degraded, as witnessed by (154).

??Jane is in Paris or in London. In fact, she is in Paris.

In this case the interpreter is left with the question why the speaker used the disjunction at all. And this question and the respective oddity of (154) is given with respect to the context in (151) as well as with respect to the context in (152).

However, note that one might have the impression that the ignorance implicature – in its standard formulation being about knowledge – can be felicitously cancelled, especially in (152-c), with (155).

Jane is in Paris or she is in London. And I know in which one.

Following Lauer (2013, 2014) (155) only shows that the characterization of the implicature of the disjunction as concerning the ignorance of the speaker is too narrow. The inference that still arises with (155) is that the interpreter is faced with the question of why the speaker used the disjunction in the first place. The interpreter will infer that the speaker has some reason not to make the stronger claim, e.g. because there might be an eavesdropper. Indeed, there might be several reasons to assert the informationally weaker, disjunctive claim, e.g. ignorance, non-cooperativity, politeness etc. All those specific inferences are brought under one umbrella in providing reasons to use the more complex form. The most general way to describe this inference that subsumes these subtle differences is to say that on all these occasions the speaker has some reason not to share more information. Hence, Lauer (2014) terms this kind of implicature Need a Reason (NaR) implicature. Uttering a more complex form that competes with a more preferred form like an outright assertion leads to the inference that the speaker has a specific reason to utter the more complex form.
It is of major importance that NaR implicatures are bound to a specific form and its competition with less complex forms. Of course, discourse participants always have some reason to utter something. This is not the target of the notion of the NaR implicature. Rather, NaR reasoning pertains to specific linguistic forms. Otherwise, this notion would overgeneralize, since it holds for any use of language and would lack explanatory strength. Oftentimes reasons for generally uttering something pertain to the specific content and how to find the right words for this content. For making this more clear, let’s quickly reconsider (152). From (152-b) to (152-c) there is a change with respect to two properties: first, there is the use of disjunction which triggers the NaR implicature, and, second, there is also a change in specificity. Importantly, we have to keep these two things apart! The interpreter might also infer that the speaker has a reason to chose this level of specificity. But this does not pertain to the used disjunctive form! Though the disjunctive form does allow for the inference of different reasons for using this specific form, the space of reasons is also restricted by the form. The reasons will in most cases somehow concern the quantity of information given by the form. Recasting the example in a slightly less natural, but more instructive way allows to get rid of this additional level.

(156) [Somewhere in San Francisco Ad and Sp are planning a dinner party, talking about who they should invite.] (adapted from Lauer (2014)[p. 22])
   a. Ad: Is Jane in town?
   b. No, she is in Europe.
   c. No, she is in Europe or in Asia.
      \[\sim Sp\] does not know that Jane is in Europe.
      \[\sim Sp\] does not know that Jane is in Asia.

29 This is also why the NaR implicature is so easily taken for a standard conversational implicature.
With the use of a disjunction in (156-c) the speaker implicates that she had a reason to choose the complex form of a disjunction rather than choosing to assert just one of the disjuncts. The most plausible reason in many and most contexts is indeed that the speaker does not know which of the disjuncts is true. But, as seen, this is not necessarily so.

In the following paragraphs I will go through Lauer’s (2014) general and precise characterization of mandatory NaR implicatures. This characterization is guided by the implicature in disjunctions, and also meant to generalize to other phenomena as well. After having provided Lauer’s (2014) characterization I will argue that if-constructions also give rise to an NaR implicature due to form.

Lauer (2014) argues that the use of a disjunction always triggers the NaR inference. This is termed non-optionality of the inference. In turn, if the speaker uses a disjunction, she should have a reason for using this form and for triggering the Need-a-Reason (NaR) inference. Building on Eckardt (2007), Lauer (2014) elaborates on the additional factor that comes in for non-optionality and complements the quantity scale (logically stronger alternative expressions) of standard conversational implicatures. On this account, non-optionality is given by two properties:

\[(157) \quad \text{(Lauer 2014: 23)}\]

\[a. \quad \text{The alternative expressions that asymmetrically entail the uttered sentence are made salient by the utterance itself.} \]

\[b. \quad \text{The alternative utterances are shorter and less complex than the uttered expression.} \]

(157-a) is shared with regular quantity implicatures, especially of the generalized kind, e.g. for ‘some’ and ‘all’. But as shown with (152-b) these implicatures are cancelable if the stronger alternative is not relevant to the immediate issue or goal of the conversation.\(^{30}\) However, with a disjunction in (152-c) the implicature arises even if the additional information is

\(^{30}\) This might be framed as a QUD. However, I suspect that the notion of a QUD might be too narrow here.
not relevant. That the implicature arises anyway is triggered by (157-b) in there being shorter and less complex forms that compete with the uttered sentence. On uttering a complex (and supposedly longer) sentence the speaker must have a reason for choosing such a sentence over the alternative forms. This is why on each use of such a sentence a NaR implicature arises. It is rather difficult to provide a definition of complexity here, but, importantly, with Biezma et al. (2013) complexity amounts to semantic as well as pragmatic processing, i.e. whether and which additional inferences are triggered by the utterance.

The non-optionality of an NaR implicature rests on the speaker (or, generally, speakers) preferring economical (i.e. optimal) expressions on every occasion of use. Lauer (2014) argues that such a preference is not given with the standard Gricean picture where pragmatic principles subserve cooperativity, which is only a sub-aspect of optimality. Rather, such a preference has to be construed as a ‘selfish’ preference. Indeed, optimality theoretic or optimization based theories of pragmatics provide a framework where pragmatic principles are not necessarily only justified by cooperativity. ‘Selfish’ concerns for economy in choosing linguistic forms can be justified by the overall cognitive architecture of speakers/human beings from an evolutionary stance. Less computational complexity means less effort and more resource conservation. Computational complexity is only justified if something is gained from the additional effort.

On Lauer (2013, 2014) a preference for a form $e$ over an alternative form $e'$ is a ceteris paribus preference. I.e. all things being equal $e$ is the preferred form. This means that if $e'$ is used, there has to be some reason why it is used, i.e. there was or is some change and things are not equal anymore. The ceteris paribus preference is overridden by the use of a more complex form. We could also say that there is a default preference for the simpler form. (158) (following Lauer (2014)) characterizes the conditions under which a NaR implicature generally arises.

(158)  (Lauer 2014: 24)
(i) There is a (default or *ceteris paribus*) preference favoring $e$ over $e'$ that applies across contexts.

(ii) Any utterance of the dispreferred form $e'$ will make the preferred form $e$ salient.

(iii) The asserted content of the preferred form $e$ asymmetrically entails the content of the dispreferred form $e'$.

Note that the particular content of what the reason for uttering the more complex construction is, is left open. However, this content is constrained by the specifics of the respective expression. Where in a disjunction what is pertinent is the quantity of information, i.e. how much information is given by the speaker, in *if*-constructions and specifically *bc* readings it is rather the relation (of relevance) between antecedent and consequent. (iii) is a condition that describes the kin relation between NaR implicatures and standard scalar implicatures. It spells out that there has to be a difference in content or logical strength, so that the two expressions $e$ and $e'$ are comparable at all. If the compared expression would carry the very same content, it would be difficult to see where the difference in complexity comes from. An underlying Gricean assumption for asymmetric entailment is that discourse participants prefer obtaining more information. Though not explicitly noted by Lauer (2014) (iii) has to refer to the conventional, *semantic* content of the respective expressions (independently of being uttered). Anticipating somewhat, with respect to the informational context update a *bc* and the update potential/content of its consequent are equivalent. But this is due to the additional pragmatic process from contextual factual independence. From the semantic point of view the content of the consequent indeed asymmetrically entails the content of the *if*-construction. The latter is semantically weaker than the former. In terms of the overall informational update, the *if*-construction is more complex, because it triggers strengthening to *ce* and thereby brings about additional processing efforts. This is what leads to the NaR implicature in the case of a *bc* reading of an *if*-construction.
Before considering the case of *if*-constructions in some more detail, let’s come back to how the general conditions for NaR implicatures are met for disjunctions. The default preference would be to utter one of the disjuncts $e = p$ if the speaker knows its truth instead of the complex disjunction $e' = p \lor q$. The more complex form makes salient the alternative of uttering either of the disjuncts alone. Further, semantically, $p$ asymmetrically entails $p \lor q$, i.e. if $p$ is true, $p \lor q$ is true as well. Because all three conditions are met, a mandatory NaR implicature will arise with the use of a disjunction.

### 4.3.2 NaR implicatures in *if*-constructions

In the following I claim that inferences that are observed with *if*-constructions are NaR implicatures that mandatorily arise on every occasion of use due to their form. The NaR inference is not just restricted to *hc* interpretations of *if*-constructions but holds for *any* *if*-construction. *If*-constructions compete with the outright declarative and unconditional utterance of the consequent not only in terms of logical strength (or informativeness), but also in terms of complexity. This generates an NaR implicature to the effect that *some* reason of why the speaker has used the more complex *if*-form has to be inferred. This inference requires more production and equally more interpretative effort.

The NaR implicature in *if*-constructions, concordant with the phenomenon in disjunctions, allows for a multiplicity of the content of the reasons for using the complex form of an *if*-construction. There are several reasons that might be inferred for the use of an *if*-construction: for *hc*, (causal) explanatory reasons allow for inferring a dependence or independence between antecedent and consequent, or, there might also be epistemic reasons; *bc* in contrast allow for practical goal-directed inferences, or, preconditional causal readings. I will come back to the *hc* readings in due course and tackle the *bc* readings in the rest of this chapter.
Before elaborating on NaR reasoning in *if*-constructions, let us see whether *if*-constructions satisfy Lauer’s (2014) conditions from (158). It is plausible to take the preference of an outright assertion $q$ over the utterance of an *if*-construction $if \ p, q$ to be a general preference of language users that is rooted in a preference of reducing processing efforts.\footnote{I assume the *if*-construction to be an indicative *if*-construction here, as I do for the whole thesis.} *If*-constructions are first, longer, and, second, more complex forms than outright assertions. That interpreting the semantics of an *if*-construction is more complex and takes more effort is, for example, reflected in the dynamic framework of chapter 3 where setting up a suppositional context is an extra step in the computation. The default preference for the outright declarative stemming from this is operational across all contexts of use. Accordingly, (i) is satisfied for *if*-constructions. (ii) is also given with *if*-constructions since the use of a restricted claim makes the use of the unrestricted form salient on the occasion of utterance. Finally, (iii) is satisfied since, logically and semantically (!), the truth of an assertion of $q$, the consequent, entails the truth of the respective *if*-construction $if \ p, q$. All conditions for an NaR implicature are at place for *if*-constructions. An *if*-construction thereby gives rise to an NaR implicature. I.e. the interpreter will infer that the speaker had some reason to use the form of an *if*-construction and to make the restricted claim.

However, there is potential criticism to the claim that uses of *if*-constructions carry mandatory NaR implicatures. In von Fintel (2001, 2009) it is argued that *if*-constructions “typically” give rise to a strengthening inference as a standard quantity implicature. The strengthening inference that the use of an *if*-construction $if \ p, q$ triggers is that the speaker does not believe that the consequent $q$ is true no matter what. Or, simplifying a bit, that it is not the case that $q$ is true no matter what. This inference is established as a standard conversational implicature that pertains to the logical strength, i.e. the informativity of the respective contents of ‘*if* $p, q$’ and ‘$q$ no matter what’. This difference in logical strength is determined by the semantics. By using the logically weaker claim, the speaker signals that...
she doesn’t believe that the stronger claim holds. In a way, these reflections use close analogues to the three claims in (158). But by strictly pertaining to the level of informational content, von Fintel’s (2009) account leads to the conclusion that if-constructions “typically trigger a strengthening inference (that \( q \) is not true no matter what)”. Indeed, the inference described by von Fintel (2001, 2009) holds for \( \mathcal{H} \) and seems to be substantial for \( \mathcal{H}_c \). But, if the inference is a standard conversational implicature, it should be cancelable. Even if we restrict our attention to \( \mathcal{H}_c \), it is not clear what a cancelation with respect to this issue even means. A sequence of ‘if \( p, q \)’ and ‘indeed, \( q \) no matter what’ seems to be infelicitous generally for \( \mathcal{H}_c \). Hence, this is some evidence that the reasoning is not a standard conversational implicature pertaining to logical strength, but rather is derived as an NaR implicature.

However, the more pressing question for a pragmatic account of \( \mathcal{B}_c \) is how to handle \( \mathcal{B}_c \)s in this picture? Indeed, what von Fintel’s (2009) account suggests is that speakers use if-constructions, because they are logically weaker, i.e. because they cannot assert the stronger information. But this is obviously not the case in \( \mathcal{B}_c \)s. In \( \mathcal{B}_c \)s speakers are typically in a position to assert the stronger information. On the informational level, there is no difference between a global update by the assertion of the consequent and the update with a respective if-construction.

Though this problem might not be completely intractable for an account along the lines of von Fintel (2009), the NaR account offers a very neat and unified picture here. Because the comparison between the if-construction and the simple form of the consequent concerns the used form and its procedural and computational complexity, this competition between forms also holds for \( \mathcal{B}_c \)s. Furthermore, Lauer’s (2014) characterization of the implicature as an inference of a reason for using the more complex form leaves open several ways to construct the specific content and kind of the particular reason. This also leads to the conclusion that the NaR implicature
is present in all kinds of readings of if-constructions, i.e. it is mandatory and not cancelable. My additional claim is that the boundary between hcs and bcs is given by the differences in how the reasons for using the more complex form of an if-construction can be constructed by the interpreter.

Indeed, the QUD account of the information structure of if-constructions provides the general frame for inferring the specific reason. Focussing on if-constructions where the antecedent is topical, the consequent has to provide a relevant answer. In contrast to the NaR implicature in disjunctions where the NaR implicatures are about the quantity of information given (how much information a speaker is willing to give), the reasons for using the form of an if-construction center around relevance, i.e. how the consequent can be a relevant answer. Hence, the kind of reason is directly related to the form-discourse mapping. Assumptions about dependence and independence in turn restrict how this relation of relevance can be constructed by the interpreter. Overall, discourse mapping and assumptions about dependencies guide the interpreter in inferring the reason of why an if-construction was used instead of an outright utterance of the consequent. hC and bC readings then are just two different subkinds of the general NaR implicature of if-constructions. They represent two different ways of establishing the reason for using the more complex form and satisfying the concomitant requirements from discourse.

On the NaR picture even though overall bCs are informationally equivalent to the outright assertion of the consequent due to CE (at least for most contexts) informational equivalence is arrived at from (i) a more complex form of an if-construction and (ii) in an indirect way as a pragmatic inferences that adds computational effort. This additional effort has to be justified somehow, i.e. there has to be a reason for the demand of this additional effort.
4.3.3 Interpretational hierarchy in *if*-constructions

In the following I will comment on the computational aspect of the interpretation of *if*-constructions. Interpreters have a strong tendency to give *if*-constructions *hc* readings, especially of the (causal) explanatory kind. I.e. *hc* readings are default if there are no contextual conditions that shift the range of available readings, i.e. the available ways to establish relevance between antecedent and consequent. This is the main role of the contextual assumption of factual independence: it shifts and restricts the way how relevance can be constructed.

*hc* readings arise because with the restrictional nature of the semantics of an *if*-construction it is natural to interpret that the reason for using the *if*-form is that a dependence of some kind holds between antecedent and consequent. This is the default way of establishing why the *if*-construction was used, similarly to ignorance being the default reason in disjunctions. For *if*-constructions, if the dependence structure of the context set allows for an inference of the dependence kind and no other information prevents it, the interpreter will construct dependence as a reason for using the *if* form.

This picture of the interpretation of *if*-constructions builds on two assumptions about the cognitive architecture of interpreters. First, as already mentioned, a preference for cognitive economy is assumed so that computational complexity without (inferential) gain should be avoided. This was needed for accounting for the non-optionality of NaR implicatures. Second, the picture of *hc* interpretation, especially of the causal explanatory kind, rests on the assumption that interpreters are dependence or causal or explanatory optimizers. The assumption about the heuristics of interpreters is that they go for dependence or *hc* readings if available in context. This e.g. means that agents would prefer to infer causal relations from correlations where possible. In this form, the claim seems to be rather strong, but, I think, it is not implausible. In a weaker form that emphasizes the central role of causal reasoning for human cognition it is indeed a claim that cognitive psychologists entertain, see e.g. Sloman (2005) and references therein.
Special cases of \( \text{hc} \) interpretations

As already noted, inferring some kind of (positive) causal connection is not the only relation that is possible in \( \text{hc}s \). Davis (1983) distinguishes two kinds of indicative \( if \)-constructions: weak and strong conditionals.

\[(159) \]
\[
\begin{align*}
a. & \quad \text{If it is humid, the TV will work.} \\
b. & \quad \text{If it is humid, then the TV will work.}
\end{align*}
\]

Davis describes the differences between the weak reading in (159-a) and the strong reading in (159-b) in the following way.

“\[(159-a)] is equivalent to an affirmative answer to the question, “Will the TV work if it is humid?” which can be justified by observing that the TV works just fine and that humidity has no effect on it. \[(159-b)] implies, in contrast, that there is some strange connection between humidity and the TV.” (Davis 1983: 58)

To begin with, on the pragmatic account taken here, weak and strong readings are not differentiated in their semantics and both readings are subkinds of \( \text{hc} \) readings. The form of (159-a), in the right context, can have a strong reading, too. In (159-b) this strong reading, what I have called (causal) explanatory reading above, following Biezma (2014), is indeed forced by the conventional meaning of ‘then’. In contrast, what is overall conveyed with (159-a) in the circumstances described by Davis is that the working of the TV is not influenced by, i.e. is independent of humidity. In spite of this element of independence in play, (159-a) is not a \( \text{bc} \). A \( \text{bc} \) reading presupposes factual independence, which is not accommodable. It is a contextual assumption. In contrast, with (159-a) independence is conveyed with the utterance. Following my argumentation in chapter 3 all \( if \)-constructions that convey something about the dependence structure in
the context are HCs. Hence, the weak reading of (159-a) is an HC reading, too. However, as I have also noted in chapter 3 it is not clear which factors are responsible for the reading that conveys independence in contrast to a reading that conveys dependence.\footnote{It is not entirely clear to me, whether the weak reading of (159-a) could not also be subsumed under the (causal) explanatory conception. Probably it is.}

Supposedly, in the context that Davis describes a weak reading arises because there is contextual information that overrides the strong reading. This is probably also connected to the discourse mapping being a consequent mapping, i.e. where the consequent provides the topic. Indeed, the weak reading in (159-a) arises under a consequent mapping ‘Under which circumstances does/will the TV work?’. A factor might be that there is the expectation that the TV will not work properly if it is humid, i.e. that humidity is an inhibitor of the TVs working. Consequently, something is conveyed about the overall structure of factual dependencies in the context that goes against this expectation. It is learned that antecedent and consequent are factually independent. However, interpreting an if-construction as conveying an independence seems to be quite complex and at least would require to model expectations about dependencies and having a better grasp of the consequent mapping of if-constructions. This cannot be done here. A more comprehensive study of this kind of HC reading has to be left for another occasion.\footnote{Davis (1983) a.o. notes that the weak reading in (159-a) can be paraphrased with ‘even if’. Indeed, the two interpretations are very close and both refer to expectations. But there is also an important difference: ‘even if’ quantifies over a whole set of antecedent possibilities and exhaustifies this set, i.e. it conveys that the consequent is true for all those possibilities. (159-a) only refers to one antecedent possibility and leaves open whether there are other salient and relevant possibilities that influence the TV’s performance.}

Briefly, I want to touch upon the issue that there are indicative if-constructions that were standardly considered to be HCs, but which could also be constructed as cases with independent antecedent and consequent. These are so-called epistemic readings like (160).

(160) I know that it was either the butler or the gardener. So, if it wasn’t the butler, it was the gardener.
The butler being the murderer and the gardener being the murderer are presupposed to be factually independent here. But obviously, no bc reading arises. This has to do with the fact that in epistemic readings the disjunction between antecedent and consequent was established beforehand or can be inferred somehow. In consequence, by NaR reasoning, the interpreter can conclude that the speaker doesn’t know which of the disjuncts is true. Thereby, the pragmatic inference to ce is blocked. One way to make sense of the if-construction then is to conceive of it as a claim about a property of the epistemic state of the speaker that she wants to make common ground. Admittedly, this is only a rough solution that is in need of further clarification. Albeit, again I have to leave this phenomenon for future research.

By now I have put forward the hypothesis that hc readings as well as bc readings are strains of NaR (Need a Reason) implicatures. With this hypothesis and the assumption that language interpreters are dependence optimizers, I have identified one kind of hc reading, i.e. the causal explanatory reading, and have discussed Davis’s (1983) weak readings. The latter fit into the general characterization of hc readings in that they allow the interpreter to learn something about the web of factual dependencies in the actual world. The reason for using the complex if-form in a context that gives rise to an hc reading is that something about the web of factual dependencies is implicated.

Equivalently, with the use of an if-construction the speaker has chosen to set up the discourse in a specific way. In case of an antecedent mapping, inferring something about the factual dependencies allows the interpreter to make sense of this and to construct the consequent as a relevant answer to the suppositional question. Hence, NaR reasoning and discourse principles are intertwined and generate the overall interpretation. The reason for using the complex form of an if-construction is constructed by way of building discursive relevance (within the if-construction).

Furthermore, it seems that the contents of antecedent and consequent have to be somehow similar and at least about the same subject matter.

See the literature about expressivism about epistemic modality, e.g. Yalcin (2011), where epistemic modals like ‘might’ are taken to refer to properties of doxastic attitudes.
For bcs the outcome of NaR reasoning is different. With the contextual assumption of independence building discursive relevance (within the if-construction) and the reason for using the more complex form via factual dependencies is blocked. This means that the interpreter has to find an alternative way for establishing felicity. Factual independence forces the interpreter to find a different reason. This proceeds by a complex inferential process that is very much the same as in indirect interpretations and pragmatic enrichment.\footnote{With indirect interpretations I mean e.g. indirect speech acts like ‘Can you pass the salt?’ a.o.} \footnote{See e.g. Benz (2006) and Benz and van Rooij (2007) for accounts of pragmatic enrichment.} In the following sections 4.4 - 4.7 I detail one way of how interpreters can build discursive relevance in bcs that also gives some leverage on the illocutionary inferences (suggestion to take biscuits) that are often associated with bcs.\footnote{Note that there might be different ways on how to build relevance in a bc interpretation. I touch on this issue in section 4.8.}

### 4.4 Pragmatic enrichment from practical needs in BCS

The heuristics that interpreters of if-constructions deploy favor hc readings if no other information prevents them. I have shown in chapter 3 that a contextual assumption of independence between antecedent and consequent proposition provides a definitional property for bc interpretations. This contextual assumption is also responsible for ce arising in specific contextual circumstances. Clearly, an assumption of independence makes an hc reading unavailable. It blocks the default way of establishing why the form of an if-construction was used. The interpreter has to reason in a different way relying on world knowledge to arrive at why a restricted claim was made (NaR reasoning). My hypothesis is that the specific flavor of paradigmatic bcs like ‘If you are hungry, there are biscuits on the sideboard’ as a suggestion or an advice relies on a particular kind of pragmatic en-
richment from practical needs. To account for this reasoning, I have to go into the meaning of antecedent QUDs or ‘What if?’ questions, what their resolution conditions are, and how to account for indirect resolution. This allows for accounting for NaR reasoning and discursive relevance in practical bc{s}. One main ingredient for this kind of constructing reasons for using a specific form is a representation of practical goals. In section 4.6 I give some evidence for how such goals are inferred in if-constructions taking cues from the literature on so-called anankastic conditionals. In section 4.7 I discuss how illocutionary inferences arise in some cases of goal-oriented bc{s} due to specific contextual settings and patterns of practical reasoning. Finally, section 4.8 tries to figure out whether this kind of goal-orientation is a general property of bc{s}.

4.4.1 What if? QUDs

With Biezma and Goebel (2019) I have established that, first, if-constructions map to discourse in a particular way, and, second, that in bc{s} the antecedent provides the QUD. NaR reasoning leads towards a solution of why the consequent is a relevant answer to the antecedent QUD. The next sections are devoted to spell out one way of NaR reasoning. Since a formalization of the meaning of an antecedent QUD or a respective What if? (WIF) question is pending and not provided by Biezma and Goebel (2019), elaborating on this is the first step. Recall that licit paraphrases are ‘What else is true in the selected worlds where the antecedent is true?’, ‘What properties do the selected antecedent worlds have?’, or, the natural language equivalent ‘What if p?’.

But assuming the Hamblin picture of questions from section 4.1, where the meaning of a question is a set of propositions that induce a partition on Logical Space, the meaning of a WIF question seems to be heavily underdetermined. A WIF doesn’t provide such a partition. Following Bledin and

39 Note that on the dynamic account adopted here in the indicative case the selected worlds are the antecedent worlds that are elements of the Stalnakerian context set, here, cs{F}.
Rawlins (2019) what a WIF question does is just to introduce a supposition, i.e. a set of worlds as a restriction of the context set, and asks what is the case at them. The major problem for the analysis of WIFs is to account for how interpreters overcome this underdetermination.

The dynamic model

In this section I extend the basics of the dynamic discourse model from chapter 3 along the lines of Bledin and Rawlins (2019). This allows to incorporate a representation of discourse structure and to give a representation of WIF questions. Understanding the details of the formal apparatus is not essential to understand the application of the basic idea about WIF questions to if-constructions and bc readings. However, it is central to understand that in Bledin and Rawlins’s (2019) view WIF questions are relational comprising two elements and thereby two major steps in their dynamic interpretation. On this account, WIFs set up a supposition and conventionally require that a felicity condition of inquisitivity is met with respect to the post-suppositional context. This felicity constraint demands the presence or accommodation of an open QUD. The spelled out meaning of the WIF for the paradigmatic bc then is ‘If the addressee is hungry, what is there to eat?’. This enriched meaning needs to be derived in a principled way. The topic of pragmatic enrichment will be my main concern. In contrast, I also briefly critically assess the account of WIF questions given by Bledin and Rawlins (2019) later on, since it is incomplete with respect to QUD mappings. However, I will go on to use their account as a preliminary working hypothesis.

For the formalization of WIF question a slightly modified and extended version of the dynamic apparatus from chapter 3 is used.40

(161) **Context** (Bledin and Rawlins 2019: 15)

A context $c$ is a tuple $(cs_c, a_c, A_c, Q_c)$ where

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40 For the detailed formalism and explanations the reader is referred to the original paper Bledin and Rawlins (2019).
a. $c_s \subseteq W$ is a set of worlds (the context set)
b. $a_r \subseteq W$ is a set of worlds (the assumption slot)
c. $A_r$ is a stack of propositions (the assertion stack)
d. $Q_r$ is a stack of sets of propositions (the question stack)

Context as a tuple and update operations on it were already introduced in chapter 3. $c_s$, the context set that keeps track of the mutually shared information and $a_r$, the assumption slot that tracks mutually accepted suppositions (as a filter), are familiar from there.\(^{41}\) If there is a proposition in the assumption slot it needs to be taken into account in the evaluation of a subsequent move (assertion or question). Additional elements are two stacks. $A_r$ is a record of the assertions made. Asserted contents are placed on top of the assertion stack and there await acceptance by the other discourse participants. Acceptance is modeled by the operation in (162): the implementation of the content of the assertion into the context set $c_s$.

\[ \text{(162) Acceptance (Bledin and Rawlins 2019: 20)} \]
\[ c + \text{ACCEPT} = \langle c_s \oplus_h \text{top}(A_r), a_r, \text{pop}(A_r), Q_r \rangle \]
Defined only if $A_r \neq \langle \rangle$
Felicity condition: appropriate in $c$ only if $c_s \oplus_h \text{top}(A_r) \neq \emptyset$

$\text{top}()$ is a function that takes a stack and gives the top of the stack, $\text{pop}()$ is a function that takes a stack and eliminates the top of this stack (Definition of $\oplus_h$: Domain-restricted informative update
\[ c_s \oplus_h \llbracket \phi \rrbracket = (c_s \cap a_r \cap \llbracket \phi \rrbracket) \cup (c_s - a_r) \]

This conception of updates by assertions makes room for the possibility of discourse participants rejecting to incorporate the proffered content into the common ground. I.e. this formalization takes seriously the character of assertions as proposals to update the context.\(^{42}\) In actual discourse, acceptance is the default move and does not necessarily need explicit linguistic

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\(^{41}\) From here on I suppress the difference between $c_sF$ and $L$ in modeling the context. For the purposes of this section $c_s$ can be seen as equivalent to $c_sF$.

\(^{42}\) The emphasis on this aspect is inspired by the discourse model provided in Farkas and Bruce (2010b) who follow informal ideas of Stalnaker (1978).
action, whereas rejection has to be marked somehow. The first condition of (162) states that if no assertion was put forward, nothing can be accepted. The felicity condition requires that only assertions can be accepted that are consistent with the information in the context set, i.e. agents cannot accept content that contradicts their mutually shared information.

The second stack $Q_c$ dynamically encodes discourse structure in the representation of context. $Q_c$ tracks the QUDs and the strategy that is at issue. On top of the stack we always find the immediate question under discussion, i.e. a set of propositions. Asking a question or implicitly bringing it up as a QUD places a question denotation on top. The questions on the $Q_c$ stack are to be resolved by the discourse participants by a correlating move on the assertion stack. If an immediate QUD is resolved, i.e. if one of its proffered alternatives is picked by an accepted assertion, the question is popped off the stack. Since $Q_c$ is a representation of discourse structure, the stack is structured hierarchically where questions higher up are entailed by questions lower down, i.e. the upper questions partially answer the ones below.

Whether a QUD on top of the $Q_c$ stack is resolved or open is defined in the following way. First, as in Roberts (2012b) (section 4.1) the QUD as a set of propositions is transformed into an equivalence relation (163-a). Worlds $w$ and $v$ are equivalent iff these worlds are members of the same propositions in a question denotation $Q$. Secondly, in (163-b) the QUD gets aligned to context, taking into account possible suppositions in $a_c$. I.e. the QUD in context ($QUD_c$) is either a partition over the (possibly) restricted context, or, just the context set if there is no question on the stack. The latter possibility is mentioned just for formal reasons. In actual discourse there will always be a question. $QUD_c$ is resolved if the number of cells

---

43 Here, there is a major difference to the assertion stack. In Bledin and Rawlins (2019) questions are not proposed and accepted but immediately take effect. Certainly, this is an idealization. For the purpose of analyzing different discourse moves, as done for rhetorical questions in Biezma and Rawlins (2017), it is crucial that questions can be proposed and then accepted or rejected, too.
of the partition equals one. This amounts to a complete answer. Partial answers just reduce the number of cells. If the number of cells is bigger than one, the context is *inquisitive* (164) and the immediate QUD is open (164).

(163) **QUD in context** Bledin and Rawlins (2019)[p. 20]

- $w \sim_Q v$ iff for each alternative $P \in Q, w \in P \equiv v \in P$ \footnote{This means that the worlds $w$ and $v$ belong to the same equivalence class $P$. An alternative way to express what is required by $\sim_Q$ is to say that there is $P \in Q$ so that $w, v \in P$.}

- $QUD_c = \begin{cases} (cs_c \cap a_c) / \sim_{top(Q_c)} & \text{if } Q_c \neq \langle \rangle \\ (cs_c \cap a_c) & \text{otherwise} \end{cases}$

Remember that a question $Q$ is a Hamblin set of propositions and these propositions may intersect. Furthermore, the propositions of this set do not have to be live options (of the context set) but either are defined over a subset of Logical Space or over the entire Logical Space. The operation $\sim_Q$ is an equivalence relation that generates equivalence classes out of $Q$. The classes of this equivalence relation are mutually exclusive and defined over the entire underlying domain, let’s say Logical Space. The purpose of (163-a) is to turn a question denotation into an equivalence relation. For constructing the $QUD_c, \sim_Q$ is applied to the top of the question stack. In (163-b) $\{ / \land \}$ forms the quotient set over the contextual assumptions (the context set and possible filters/suppositions from the assumption slot) and the equivalence relation. The quotient set is the set of equivalence classes over a specified underlying domain, here $(cs_c \cap a_c)$, and the immediate question on top of the question stack. With this the equivalence relation from the question on top of the question stack gets restricted to the context set. The second case captures the case of an ‘empty’ QUD in context, i.e. where no alternatives are proffered to distinguish between.

(164) **Inquisitiveness** (Bledin and Rawlins 2019: 20)

A context $c$ is *inquisitive* iff $|QUD_c| > 1$
The basic idea with respect to *if*-constructions is that they first update the assumption slot with the content of the *if*-clause (165). For declarative *if*-constructions the second step consists in placing the content of the consequent on top of the assertion stack as a proposal to answer a QUD on $Q_c$. Importantly, the answer is a restricted one, since the assumption slot functions as a filter on each element of the context, i.e. on both stacks and the context set. If the content of the *if*-construction is accepted, the context set $cs_c$ is updated by domain-limited update (see chapter 3 3.5.1).

\[(165)\] \textbf{Assuming} \[c + \text{ASSUME}(\phi) = \langle cs_c, a_c \cap \llbracket \phi \rrbracket, A_c, Q_c \rangle\] Defined only if $cs_c \cap a_c \cap \llbracket \phi \rrbracket \neq \emptyset$

This is illustrated by (166). Discourse participant A puts forward a question that is the immediate QUD. B gives a restricted partial answer. First, the antecedent introduces a filter on the context and with this on the QUD stack. The filtered question of who comes to the party receives a partial answer for this supposition.

\[(166)\] A: Who is coming to the party?  
B: If he finishes work early, Bill is coming.

Interrogative *if*-constructions work in a similar way. After updating the assumption slot, the question in the consequent is put on top of $Q_c$. The question is only asked with respect to the restricted, local context. This follows Isaacs and Rawlins’s (2008) account of interrogative *if*-constructions. In (167) the antecedent introduces a supposition into the assumption slot. The question in the consequent is only asked with respect to the so-restricted context and does not pertain to the global contextual information outside the filter.

\[(167)\] If we schedule the party on a weekday, who is coming to the party?
Bledin and Rawlins (2019) account of WIF questions directly builds on this account of interrogative if-constructions where a supposition is introduced and a question is put forward with respect to the restricted context. What the account has to deal with is that in WIFs the question in the consequent is not spelled out. That something specific is asked about the suppositional context is achieved on Bledin and Rawlins’s (2019) by a felicity constraint that the WIF question carries conventionally. The dynamic semantic entry for WIFs that deploys such a felicity constraint is given in (168).

(168)    **WIF update** (Bledin and Rawlins 2019: 26)

\[
c′ = c + \text{``What if } \phi?\text{''} = c + \text{ASSUME}(\phi)
\]

Felicity condition: appropriate in \(c\) only if

\[|\text{QU}_D| > 1\]  \hspace{1cm} \text{(Inquisitiveness)}

The entry in (168) is carefully formulated and avoids problems of a former proposal for the meaning of WIF questions presented in Rawlins (2010). In this latter paper it is proposed that the QUD in the local context (\(\text{QU}_D\)) is anaphorical to the QUD of the global context. Guiding for this analysis are cases of conversational backoff where the speaker resists to accept an assertion that is meant to answer the global QUD (169) by re-asking this QUD for a hypothetical, restricted context.

(169)    A: Who is coming to the party?
B: Bill is coming.
A: What if Jane is coming?

The WIF question on the anaphorical account is interpreted as ‘If Jane is coming, is Bill coming?’. Even though the anaphorical account gives the right results for conversational backoff cases, it does not give the right results for other cases, e.g. (170).

(170)    A: Who is coming to the party?
B: ??What if we play country music?
The anaphorical account would predict that the WIF question has to be interpreted as ‘If we play country music, who is coming to the party?’. But intuitively it seems that the WIF question does not establish this meaning. Indeed, it rather seems infelicitous by not giving an answer to the established QUD but rather suggests to play country music to get as much people as possible to come to the party to make it a good party.

Bledin and Rawlins (2019) discuss more cases that disprove the anaphorical account. These are e.g. WIF questions that are discourse initial, i.e. where no QUD is given beforehand, i.e. where no anaphorical binding to a given QUD is possible, like in (171).

(171)  What if I tried to to jump out of the window with an umbrella?

However, it is mainly suggestive uses like (172) that drive Bledin and Rawlins (2019) towards (168) where WIF questions are heavily underdetermined with respect to which QUD or issue is at stake in the local, restricted context. The major claim behind (168) is that a WIF question just requires the suppositional context to be somehow inquisitive. This inquisitivity, i.e. that there is an open QUD in the suppositional context, can be brought about in different ways. Bledin and Rawlins (2019) argue that in most cases the felicity constraint of inquisitivity triggers accommodation of a new QUD. They provide a particular model of the accommodation process for examples like (172), where accommodation takes place pertaining to a practical goal.

(172)  A: Who should we invite to speak at the next linguistics colloquium?
       B: What if we invite Professor Plum?

The specific trigger for this kind of accommodation process of a QUD is that the WIF question picks out a particular answer to the global question, i.e. inviting Professor Plum. But with this the initial global question is resolved with respect to the suppositional context. I.e. somebody is invited in the hypothetical context and the question about whom to invite cannot
anaphorically satisfy the felicity constraint. The suppositional context is not inquisitive with respect to the question about possible invitees (i.e. ‘If we invite Professor Plum, who should we invite?’ is obviously infelicitous.). So the question arises of what determines the local QUD in the suppositional context then? Bledin and Rawlins (2019) provide a formal apparatus that provides the intuitive result that the spelled out WIF QUD is something along the lines of ‘If we invite Professor Plum, what do the worlds look like with respect to achieving the goal of a good and successful colloquium with respect to this invitation?’.

In the following I argue that the apparatus that Bledin and Rawlins (2019) use to account for WIF questions like (172) can also be adopted to model the interpretation of bcs that give rise to illocutionary inferences like the speaker suggesting to take and eat some biscuits. In section 4.8 I consider the generality of this account by means of further examples. To anticipate, just as in regular WIFs, also in the interpretation of bcs there might be more than one way to pragmatically enrich.

**Blindspots: WIFs from information structure**

Before presenting Bledin and Rawlins’ (2019) account of pragmatic enrichment I here want to critically assess their perspective on WIF questions. Though, I will use their account of WIFs under reserve nonetheless. Bledin and Rawlins (2019) aim to give an account of natural language ‘What if ...?’-questions. However, for an implementation of Biezma and Goebel’s (2019) account of the interpretation of if-constructions a formal representation of information structure is needed where the introduction of a supposition is tightly linked to the QUD stack. The link provided in Bledin and Rawlins’s (2019) – the felicity constraint for the QUD stack – is not enough for accounting for the information structure of if-constructions. In their account, topicality is implicitly assumed because their objects of investigation are explicit ‘What if ...?’-questions and not the link between the information structure of a full (declarative) if-construction with antecedent and consequent. Asking an explicit WIF question automatically makes the
supposition topical and the respective answer is interpreted accordingly. But topicality *per se* is not represented in Bledin and Rawlins’s (2019) account. The supposition does not change or manipulate the QUD stack, but only requires that it is inquisitive. In contrast, Biezma and Goebel’s (2019) account of information structure would require that the utterance of an *if*-construction either puts a respective antecedent or consequent QUD on the QUD stack (if it is not there already).

An implementation along these lines would amount to a major change in comparison to Bledin and Rawlins’s (2019) perspective. WIF QUDs then are not relational between the assumption slot and some QUD that pertains to the suppositional context. The supposition directly manipulates on the QUD stack and requires either an antecedent question ‘What is the case in the antecedent worlds?’ or a consequent question ‘Under what circumstances is the consequent true?’ Rather, the QUD that is required by the information structure of the respective *if*-construction is directly put on the QUD stack. However, the antecedent question that is given with a *bc* is underdetermined because it just asks for all the propositions that are true throughout the suppositional context. This question then needs to be restricted in terms of which information counts as an answer in the specific circumstances. In respect to this setting we could speak about the accommodation or assignment of resolution conditions for the respective QUD. What I want to focus on in the following sections is one way of how the resolution conditions of antecedent QUDs for *if*-constructions with a *bc* reading are determined. For this endeavor I adopt Bledin and Rawlins’s (2019) account of resolution conditions. The specific solution for this very problem is compatible with the modified conceptualization of QUDs for *if*-constructions that I just sketched.

45 Similarly for consequent QUDs.
46 This is similar to what van Rooy (2003) observes about constituent questions. Indeed, the mechanism from van Rooy’s (2003) account is used by Bledin and Rawlins (2019).
For a suppositional QUD, there are always two elements involved, setting up a supposition and providing a resolution for the suppositional context. The difference is in how the QUD stack and the supposition are related. On the full-fledged QUD account of Biezma and Goebel (2019) with a \(bc\) reading of an \(if\)-construction an antecedent QUD is put on the QUD stack. The pragmatic enrichment mechanism that Bledin and Rawlins (2019) argue to provide a new QUD for the suppositional context has to be reinterpreted on the full-fledged account as supplying the resolution of the antecedent QUD.

As far as I can see there are two possibilities of implementing the information structural features from Biezma and Goebel (2019) into a dynamic framework. Either, we add another linking principle to Bledin and Rawlins’s (2019) account that requires the adoption of an antecedent or a consequent QUD on the QUD stack. However, then, it is not clear whether the assumption slot is either redundant, because an antecedent QUD might be enough to introduce a supposition, or, the function of the assumption is not unified. Another way is to directly encode the restrictional nature of QUDs, and suppositional QUDs in particular, into the formal framework following Aloni et al. (2007). This makes possible to give up on the assumption slot altogether. Yet, the details of how to account for information structure for \(if\)-constructions in a more precise way has to be left for future research. For the rest of the dissertation I will follow Bledin and Rawlins’s (2019) relational account of WIF questions but indicate at one important section how the original QUD from Biezma and Goebel (2019) account makes a difference at this point.
4.4.2 Resolution and domain goals

In the following I show how the WIF QUD is constructed in the interpretation of paradigmatic bcs like (173). As has been emphasized in the preceding paragraph, the crucial factor is how the felicity constraint of the WIF question gets satisfied. Turning to bcs I will speak of the resolution conditions or simply the resolution of the antecedent WIF that have to be elucidated. The question to be answered is: what are the resolution conditions for if-constructions like (173)?

(173) If you are hungry, there are biscuits on the sideboard.

For now, let’s assume that the utterance of (173) is discourse initial. Following Roberts (2012b) every discourse structure serves a major discourse goal. This goal is to answer the question ‘What is the world like?’ or ‘What is the case?’. Formally, this is the most abstract and fine-grained question where each single world is an answer to the question, i.e. a set of singletons each comprising one possible world. Roberts (2012b) terms this most abstract question the Big Question. Adapted to the case of an if-construction that is interpreted as a bc like (173), the spelled out WIF QUD would be ‘If you are hungry, what is the case?’ where each world in the restricted context set provides an answer. If one is to adopt this take on the resolution conditions for (173) the provided answer given in the consequent is ‘There are biscuits on the sideboard’. However, assuming with Groenendijk and Stokhof (1984) that the meaning of a question is the set of its exhaustive answers, the consequent answer can only be a (very) partial answer to the restricted Big Question about what is the case in the suppositional context. It only describes a single detail of a possible world. A complete answer to a WIF would be a complete enumeration of all the sentences that are true throughout the determined set of worlds. But this conception of the resolution condition of WIFs is obviously too fine-grained. In real life dis-

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47 This possibility is also discussed and pondered for some cases by Bledin and Rawlins (2019).
course, somebody asking ‘What if p?’ or setting up a WIF discourse with an if-construction, first, is neither interested in every accidental aspect of the antecedent worlds in the context set and, second, also not interested in a complete answer to the restricted Big Question.

Consider (174). It brings out that after the utterance of the paradigmatic \textbf{bc} ‘If you are hungry, there are biscuits on the sideboard’ neither the addressee goes on to ask about other aspects of the suppositional context (174-a) nor does the speaker follow up with questions and answers about further aspects (174-b). Both of these kinds of follow up moves would be licit if the resolution conditions would really be given by something like the restricted Big Question.

(174) a. What else is the case if I’m hungry? Is grass still green?
   b. And if you are hungry, my car is parked outside. And if you are hungry, you get angry.

It is clearly not a relevant issue whether grass is green in the antecedent worlds nor whether the speaker’s car is parked outside. The subject matter of being hungry and the color of grass are intuitively not related to each other just like there being biscuits on the sideboard and the question regarding the color of grass are intuitively not related. Rather, the consequent of a bc by itself supplies a sufficient (and probably exhaustive) answer that is somehow related to the antecedent. I.e. the answer is relevant and sufficient (and exhaustive)! But what are the resolution conditions of the WIF question it provides a sufficient answer to?

In general the hypothesis that discourse participants employ the Big Question directly is rather implausible. Bledin and Rawlins (2019) note that in discourse initial WIFs, follow-up questions standardly supply aspects that indicate what the speaker is interested in, i.e. what she considers to be relevant aspects. It is one of the major purposes of discourse structure
spelled out as a hierarchy of questions to account for this *coarsening*.\textsuperscript{48} Hence, for the interpretation of a \textit{bc} the resolution of the WIF QUD has to be more coarse, i.e. focussed on particular aspects of the antecedent worlds. These aspects have to be relevant \textit{in or for} the suppositional context.

In \textit{bcs} the relevant coarsening is indicated by the spelled out answer in the consequent that the speaker volunteers to provide. In section 4.2 I already pointed out that Biezma and Goebel (2019) draw a parallel between follow-up questions that clarify the relevant aspects and the role of the consequent in \textit{if}-constructions.

“The mechanisms at play are somewhat similar to those proposed in Roberts (1996); Büring (2003); Biezma and Rawlins (2012), where it is noted that a question may be followed up by a sub-question as a way of clarifying the speaker’s goal regarding the original question, e.g. How was your date? Was the food good? vs. How was your date? Was the man handsome?. In the case of BCs, it is the answer to the question what allows us to identify the QUD targeted by the speaker, not a subquestion.” (Biezma and Goebel 2019: footnote 29)

A parallel phenomenon is present in questions like \textit{‘What properties does individual x have?’}. Such a question in context never asks for every aspect of an individual since an individual has infinite properties. Suppositional WIFs work similarly. The only difference is that it is not asked about properties of individuals but about properties of possibilities, i.e. \textit{‘What properties do antecedent worlds have?’}.

As said, for accounting for relevant aspects, i.e. resolution conditions of the WIF QUD, we have to take into account that the mapping of the \textit{bc} into discourse as a double move. With the utterance of a \textit{bc} the speaker volunteers to give an answer to the WIF QUD she chose to set up. For a \textit{bc} like (173) native speakers are very quick to arrive at the enriched WIF QUD which can be circumscribed more technically with \textit{‘What do the

\textsuperscript{48} These kinds of answers are more coarse because they do not refer to the finest partition where a single world provides an answer.
selected antecedent worlds look like with respect to what food there is (nearby) that might solve the hunger?’. Importantly, the resolution of the WIF in (173) is not given by the question ‘What things are there?’, which is a question too general. The resolution is rather about edibles that can help to solve the hunger problem. But as easily native speakers derive this, as hard it is to come up with a model of the mechanism involved.

The following (175) is a modification of an example given in Franke (2009) and serves to clarify and carve out the problems that a theoretic account is faced with.

(175) Berta is helping Annette to pack for a trip. Annette kneels at her suitcase and tells Berta where the stuff that she needs is (e.g. ‘My toothbrush is in the bathroom’) and Berta brings it to her.

a. Annette: If you are hungry, there are biscuits on the sideboard.

Let us translate this example into the framework of Bledin and Rawlins (2019). In the global context the QUD that Annette and Berta (implicitly and mutually) agreed to adopt as their discourse goal is something along the lines of ‘What are the things to be packed?’ (176).

(176) \langle cs_c, a_c, \mathcal{A}_c, \llbracket \text{What are the things to be packed?} \rrbracket \rangle

Annette’s utterance of the if-construction in (175-a) updates the assumption slot (177) and then the assertion slot by domain restricted update (178).

(177) \langle cs_c, a_c, \cap \llbracket \text{Berta is hungry} \rrbracket, \mathcal{A}_c, \llbracket \text{What are the things to be packed?} \rrbracket \rangle

(178) \langle cs_c, a_c, \cap \llbracket \text{Berta is hungry} \rrbracket, push(\llbracket \text{There are biscuits on the sideboard} \rrbracket, \mathcal{A}_c), \llbracket \text{What are the things to be packed?} \rrbracket \rangle
Importantly, the assertive update in (178) is subject to a felicity condition
which requires an assertion to be congruent to the immediate $QUD_c$, or
else, a new immediate $QUD_c$ has to be accommodated.

(179) **Assertive update** Bledin and Rawlins (2019)[p. 19]
$ c + \text{Assert}(\phi) = \langle cs_c, a_c, \text{push}(\llbracket \phi \rrbracket, Q), Q_c \rangle $
Felicity condition: appropriate in $c$ only if
$ \llbracket \phi \rrbracket \cap P \neq \emptyset $ for some $P \in QUD_c$

Actually, the felicity condition is met without accommodation and Berta
could go on to (probably tacitly) accept the restricted assertive update. $cs_c$
gets updated by domain restricted update and the assertion slot is popped
(180).

(180) $ \langle cs_c \oplus a_c, \llbracket \text{There are biscuits on the sideboard} \rrbracket, a_c \cap \llbracket \text{Berta is hungry} \rrbracket, \text{pop}(A_c), \llbracket \text{What are the things to be packed?} \rrbracket \rangle $

We have to keep in mind that the update by domain limited update $\oplus a_c$
only encodes the *semantic* update. This semantic update is supplemented
with the pragmatic reasoning from independence (chapter 3) to a global
update with the consequent proposition as in (181).

(181) $ \langle cs_c, \oplus a_c, \llbracket \text{There are biscuits on the sideboard} \rrbracket, a_c \cap W, \text{pop}(A_c), \llbracket \text{What are the things to be packed?} \rrbracket \rangle $

Indeed, this is the update we would get if the simple hypothesis was
adopted that the QUD in the suppositional context is (anaphorically) given
by the QUD in the global, non-restricted context. I.e. the *if*-construction
would be interpreted as giving an unconditional answer *‘There are biscuits
on the sideboard (for packing).’* to the question of *‘What are the things to be
packed?’*. 
But this way of formalizing (175) goes awfully wrong. It does not capture the intuitions of natural language interpreters, because in the formalization the consequent ‘There are biscuits on the sideboard’ is understood as an answer to the QUD ‘Where are which things for packing?’, or, respectively, a subquestion of this question. In contrast, this is not the question that the consequent intuitively answers. I.e. the consequent is not meant to be a relevant answer to the question of ‘Where are which things for packing?’. Let’s consider (182-a) and compare it to (182-b).

(182) Berta is helping Annette to pack for a trip. Annette kneels at her suitcase and tells Berta where the stuff that she needs is (e.g. ‘My toothbrush is in the bathroom’) and Berta brings it to her.

a. Annette: There are biscuits on the sideboard.

b. Annette: If you are hungry, there are biscuits on the sideboard.

On the informational level, both answers convey that there are biscuits on the sideboard unconditionally. The plain assertion of the consequent in (182-a) will lead to Berta’s bringing the biscuits to Annette, so that she can pack them for the trip. Berta will understand Annette’s utterance as a request for bringing the biscuits for the purpose of packing and as an answer to the QUD ‘What are the things to pack?’ or a subquestion of it that serves this purpose. In contrast, with the if-construction in (182-b) the interpreter, Berta in this case, infers that the information given with the consequent, though it holds not only for the restricted context set, is given for a different practical purpose. The QUD in (182-b) clearly is ‘If Berta is hungry, what food is there?’ But this paraphrase is not enough. ‘What food is there?’ formally is still a possible subquestion and may be part of a strategy to answer ‘Which things for packing are where?’. (182-b) rather answers ‘What food is there that Berta can eat to ease her hunger?’
The crucial point is that there are different practical goals at issue in the global context set (182-a) and in the hypothetical, restricted context set (182-b). For the global context set it is Annette’s getting packed that is the practical goal which Berta and Annette have agreed on. But with the antecedent of the if-construction in (182-b) Annette brings up a different hypothetical goal and provides information of how to best achieve this hypothetical goal from her perspective. The goal that she establishes with respect to the hypothetical situation as a mutual goal is to ease Berta’s hunger. Hence, the QUD is rather ‘If Berta is hungry, which food is there to ease the hunger?’ which is a question that is governed by ‘If Berta is hungry, what to do?’. There are many conceivable actions that might achieve the easing of the hunger. Certainly this depends on which options are open to the agents, which of them they are aware of, but also on how much effort (time) they have to put into realizing these options and what other preferences are at stake. E.g. they could also go to the lovely asian restaurant across town. But considering Annette’s other goal, i.e. her preference for getting packed, by indicating that Berta should eat the biscuits, she also indicates that she takes this option to be the optimal one. The optimality of the indicated action effectively puts a constraint on the resolution conditions of the WIF QUD. The WIF QUD ‘If Berta is hungry, what is there to eat?’ that subserves the goal of easing the hunger does not require a complete answer in the sense of enumerating all kinds of food that are there. It rather suffices that Annette indicates the action that is optimal from her perspective by only mentioning one kind of food and its location.

Contrasting the issues that are at stake in the global context and in the restricted context (183), we can see that the mutually adopted goal(s) select the aspects which govern the resolution conditions of the WIF QUD set up by the antecedent. In (182-b) it is not what things there are to pack, but, what things there are to eat.

(183) a. **Goal:** Get Annette’s suitcase packed.
   **Subserving QUD:** What things are there to be packed?
b. **Goal:** Easing Berta’s hunger.

**Subserving QUD:** What things are there to ease the hunger?

These observations bring out the intuitions regarding the role of the *if*-form in contexts like (182). The *if*-construction serves to make salient or bring about a change in the practical goal that the discourse centers around. With this, two questions for a theoretical account result. First: how to implement practical goals into the discourse model, i.e. how to formalize them and especially how to link them to QUDs? Second: How is a change with respect to the practical goal triggered?

As we will see, Bledin and Rawlins (2019) provide a worked out answer to the first question. On their account practical goals can serve as resources for the accommodation of new QUDs if this is called for. QUD accommodation is conceptualized as a general pragmatic repair mechanism. With respect to explicit WIF questions and Bledin and Rawlins’s (2019) running example (172) (repeated below for convenience as (184)) QUD accommodation from practical goals is one important method of satisfying the felicity condition from (182) for explicit WIF questions.

(184)  

a. A: Who should we invite to speak at the next linguistics colloquium?  

b. B: What if we invite Professor Plum?

As noted, Bledin and Rawlins’s (2019) account of explicit WIF questions is very minimal for the sake of covering the multitude of possible readings. A WIF question sets up a supposition and the felicity condition requires the suppositional context to be *somehow* inquisitive. QUD accommodation from a practical goal comes in for (184) because the question in (184-a) cannot provide inquisitivy for the suppositional context. This is due to (184-b) selecting a possible answer to (184-a) as a supposition. Hence,
felicity has to be satisfied via a repair step, i.e. QUD accommodation.49
This is Bledin and Rawlins’s (2019) answer to the second question about
how the accommodation from practical goals is triggered, at least for their
central example (184).

But we have to think about what triggers the change of the practical
goal in the case of (182) where a complete \textit{if}-construction and an implicit
QUD mapping is involved. In particular, it is not the same triggering from
a need for inquisitiveness like in (184). The suppositional context indeed
could be inquisitive from the QUD of ‘What are the things to pack?’ But, as
said, this is not in line with intuitions. So, what triggers accommodation
in this example? The answer that I offer in section 4.5.2 makes use of
NaR reasoning. As I have argued, there is a tight link between NaR
reasoning and the discourse mapping of \textit{if}-constructions. \textit{If}-constructions
by their form (plus additional contextual information) map to discourse
in a specific way. And if the speaker has chosen to set up a particular
discourse structure via information structure this has to be satisfied by
NaR reasoning. At the end of section 4.4.1 I have indicated that Bledin
and Rawlins’s (2019) account of WIF questions is not entirely adequate to
model the discourse mapping of \textit{if}-constructions, since the introduction of
a supposition is not reflected on the QUD stack. Because of this, their model
does not represent why a change in the practical goal for the discourse is
triggered in cases like (182). If the supposition is modeled as a WIF QUD
on the QUD stack the introduction of this new QUD can be seen as a factor
that triggers the change of the practical goal. In this picture, a new practical

\footnote{Bledin and Rawlins (2019) are explicit about the fact that their suggested accommo-
dation mechanism from practical goals is only one way of accommodation or repair:
“Any new questioning must be a secondary pragmatic effect coming by way of the ac-
companying felicity condition requiring that the discourse context be inquisitive after
the assumption slot has been narrowed [...] .” [p. 26/27] And furthermore: “The appeal
to QUD accommodation raises the puzzle of which questions are accommodated in
particular examples and why these questions are used to repair the discourse context
rather than others.” [p. 31]}

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goal guides the accommodation of particular resolution conditions for this antecedent QUD on the stack. Indeed, this is the factor that we can identify in example (182). The suppositional question on the QUD stack helps to indicate and trigger the intended change.

However, how to represent this formally is a question for further research. In the following I stay within the formal account of Bledin and Rawlins (2019) and treat the NaR reasoning as an external factor to their representation. The issue I go on to focus on in the next sections is BC readings in practical contexts. This requires a formal understanding of practical goals that is given in the next section.

4.5 Practical goals, discourse and pragmatic enrichment

The effect of uttering the if-construction in (182-b) is very similar to the utterance of a sequence of sentences like ‘You look hungry. There are biscuits on the sideboard’. Johnson-Laird (1986) has early on observed that the inferential mechanism in BCs has a striking similarity up to identity to what is known as particularized conversational implicatures (185).

(185) a. A: I am out of petrol.
   B: There is a garage round the corner. (Grice 1989: 32)

b. If you’ve run out of petrol, there’s a garage down the road.
   (Johnson-Laird 1986: 70)
Benz (2006); Stevens et al. (2016) have shown how a framework that implements practical goals can account for cases like (185-a).\textsuperscript{50} Suggestions along these lines were also made by van Rooy (2003) for mention-some questions, Bledin and Rawlins (2019) for suggestive WIF questions, and Davis (2009) for Japanese discourse particles.\textsuperscript{51} Hence, such a framework is independently motivated. In the following I show how practical goals help to account for formulating resolution conditions for the antecedent QUD and the multiple inferences that we observe with $\text{bc}s$.

In the afterword Roberts (2012a) to her renowned paper Roberts (1996, 2012b) that gives a detailed account of the QUD framework, Roberts stresses two points that were only in the margins of the original paper. First, in the original paper the QUD representation is a representation of information structure. But, she argues in Roberts (2012a), information structure is part of a more general structure, i.e. intentional structure. Information structure pertains to factual aspects of the world that have their equivalents in the truth conditions of sentences. The general goal in a discourse structure and the respective QUD hierarchy is to answer the Big Question of ‘What is the world like?’ However, the other part of intentional structure is that agents inquire in to the subquestions of the Big Question because they pursue practical goals, i.e. they want to be able to

\textsuperscript{50} In a recent paper Hesse et al. (2018), which I only got aware of lately, the computational framework of Stevens et al. (2016) for a Q/A system is extended to account for $\text{bc}s$. However, this account is quite restricted. It only looks at sales conversations in the real estate domain where $\text{bc}s$ are used as answers to (explicit) polar questions. With respect to $\text{bc}s$ the account is rather descriptive and taxonomic. In particular, Hesse et al. (2018) do not consider the link between linguistic form, discourse and world knowledge. Discourse principles and information structure are not taken into account, e.g. that polar questions are only making explicit alternatives from constituent QUDs (see Biezma and Rawlins (2012)). However, it is shown how decision theoretic resources play a role in the interpretation of $\text{bc}s$ in such contexts.

\textsuperscript{51} Practical goals in these accounts are represented as decision problems just like in decision theory. Arthur Merin was the first scholar, who used decision theoretic tools for formal pragmatics within his decision theoretic semantics. All of the accounts mentioned here can be directly tracked to his work. However, there are several differences between his account which uses the full range of decision theory. Merin directly formulates his framework in terms of decision problems and does not make a difference between discourse and domain goals. Furthermore, he conceptualizes discourse rather as competition than as cooperation. Due to this, his overall account turns out to be very different from the one presented here.
act and satisfy their needs and preferences. These real world goals motivate why agents engage in the Big Question at all. Hence, discourse is not only driven by the question ‘What is the world like?’, but also by the question ‘What should we do?’ or ‘What to do?’. This difference is captured in Roberts’s (2012) distinction between discourse goals (‘What is the world like?’) and domain goals (‘What should we do?’).\footnote{The aspect of domain goals actually also shows up in a specific domain of linguistic forms, i.e. the sentence type of imperatives. See e.g. Condoravdi and Lauer (2012).}

“Besides the discourse goal of inquiry in its most general sense, we usually have separate goals in the real world, our domain goals, and these goals, in the form of deontic priorities, generally direct the type of conversational inquiry that we conduct. We are, naturally, most likely to inquire first about those matters that directly concern the achievement of our domain goals.” Roberts (2004)[p. 210]

Domain goals can be any goals that a discourse participant has, like finding an Italian newspaper, getting the salt, making it to the theatre on time, eating food to ease hunger etc. However, when entering a discourse with another agent and asking for information like ‘Where can I buy an Italian newspaper?’ the discourse participants have to agree about the discourse goal. In particular, they have to coordinate their goals and preferences. In the simple case where a passer-by asks where she can buy an Italian newspaper, we do not have any reason that the goals of the addressee clash with the goal of the questioner. But already with (175) we see that things are not always as easy. Berta’s hypothetical hunger might be a threat for Annette’s goal of packing. A goal that Berta and Annette mutually adopted. But hungry Berta could just stop to help Annette pack and go down the street to the Korean restaurant. Annette’s utterance helps to coordinate on different preferences. Suggesting to eat the biscuits and not going to the restaurant is the best option in light of the other mutually adopted goal of packing. Hence, it is important that domain goals, just like discourse goals (QUDs) are mutually agreed and coordinated on. Certainly, the adopted
domain goal might have the aim of satisfying the preferences of one specific discourse participant (Berta’s hunger problem), but as is clear from (175), the preferences of the other discourse participants, especially the ones of the speaker, also have to be taken into account. It is important to emphasize the mutual character of domain goals and the collaborative work for finding a way of achieving them even if they pertain to a specific person. This is even the case in more non-cooperative settings like (186).

(186) Driving on the autobahn, the child in the back of the car sees the McDonald’s sign.

a. Child: Mom, I’m hungry. Can we go to McDonald’s, please?
b. Mom: If you are hungry, there are biscuits in your lunchbox.

(186-b) serves to coordinate the preferences between the mom and the child via a power imbalance. Mom has the power to determine which preferences to adopt. In the literature using representations of domain goals, scholars often talk in a way that implies or even explicitly states that the goals and preferences are exclusively the ones of the speaker. However, both of these items – speaker’s and addressee’s preferences – have to be coordinated in discourse.\textsuperscript{53}

4.5.1 Formalizing practical goals

Let us turn to the formalism. Bledin and Rawlins (2019) build on van Rooy’s (2003) work and formalize domain goals as qualitative decision problems. Each decision problem determines a question denotation, i.e. a set of propositions that is called the best action set. With this at hand the interrelations between QUDs and domain goals as decision problems is formulated by Bledin and Rawlins (2019) with help of the discursive con-

\textsuperscript{53} Murray and Starr (2018) give a comprehensive model of context that tries to model how individual and mutual states that encompass preferences interact.
straint of *Subservience*. This principle constrains the intentional structure of discourse such that each QUD subserves a domain goal. On my take, the subservience relation encodes one kind of reason why an agent chose to set up the discourse in a specific way.

Decision problems represent the preferences of agents over a set of (contextually relevant and salient) outcomes or options. These outcomes have to be *achievable* by actions of the agent constrained by whether these actions are possible with respect to what is known about the actual world (the possibilities in the context set). This means that there are three basic components of a decision problem: states of the world, potential actions in these states, and the agent’s preferences over the potential outcomes. Outcomes are given as the Cartesian product of world states and the potential action.

(187) **Decision problems** (Bledin and Rawlins 2019: 35)

A decision problem DP is a tuple \( \langle A, S, U \rangle \) where

a. \( A \subseteq \mathcal{P}(W) \) is a partition of \( W \) (the action set)

b. \( S \subseteq \mathcal{P}(W) \) is a partition of \( W \) (the state set)

c. \( U : A \times S \rightarrow \mathbb{R} \) is an ordinal utility function \(^{54} \)

**Independence condition**: DP is well-formed iff for each \( a \in A \) and \( s \in S, a \cap s \neq \emptyset \) \(^{56} \)

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\(^{54}\) Bledin and Rawlins (2019) do not require the action set or the state space to cover \( W \). However, the portion not covered may be termed the *residual* (Cariani et al., 2013) where no action is taken. Indeed, it makes sense to include this option as an action in a technical sense.

\(^{55}\) Ordinal utilities as numbers give a ranking of propositions. In contrast to expected utility functions that are standardly used in decision theory, ordinal utilities do not encode *distances*, i.e. how much more or less an outcome is preferred relative to another outcome.

\(^{56}\) Bledin and Rawlins (2019) here adopt orthogonality from Lewis (1988) to capture the standard definition of probabilistic independence of acts and states to prevent so-called Newcomb problems. However, in light of the problems of evidential decision theory, I think we might also need a stronger notion of independence for this qualitative representation, i.e. either factual independence in the sense of chapter 3 or some notion of causal independence. The implementation of this idea is also left for the future.
Note that actions are represented as propositions that comprise the worlds where the action is taken. These are the options that the agent can realize at will by acting. The alternatives in the state space, however, can not be influenced by the agent. An action-state pair \(\langle a, s \rangle\) determines an outcome. With respect to these outcomes, the agents have particular stances, i.e. they like to see them realized or don’t want them to get realized etc. These attitudes are encoded in the utility function. In the end, which action an agent performs depends on the utility function that represents her preferences.

Bledin and Rawlins (2019) note that this utility ordering is similar to Condoravdi and Lauer’s (2012) effective preference ordering, where “the set of propositions \(\{a \cap s : a \in A, s \in S\}\) with ordering \(a \cap s \leq a' \cap s'\) iff \(U(a, s) \leq U(a', s')\) is a preference structure” (Bledin and Rawlins 2019: 35). In section 4.6 I work with this slightly simpler notion that in a way collapses the distinction between actions and states. Until then I stick with Bledin and Rawlins’s (2019) terminology.

Decision problems give a neat picture of decision situations. A classical example adopted from van Rooy (2003) is an agent who wants to buy an Italian newspaper and considers what she should do. She can walk to the station or to the palace to buy one. Her decision problem then is represented in (188).

\[
A = \begin{cases}
\lambda w. \text{walk to station in } w, \\
\lambda w. \text{walk to palace in } w, \\
\lambda w. \text{stay put in } w
\end{cases}
\]

\[
S = \begin{cases}
\lambda w. \text{newspaper available only at station in } w, \\
\lambda w. \text{newspaper available only at palace in } w, \\
\lambda w. \text{newspaper available at both locations in } w, \\
\lambda w. \text{newspaper available at neither location in } w
\end{cases}
\]

Following Bledin and Rawlins (2019) I here represent propositions with lambda notation abstracting over possible worlds.
\[ U(\lambda w. \text{go to station in } w, \lambda w. \text{paper only at station in } w) = 1 \]
\[ U(\lambda w. \text{go to palace in } w, \lambda w. \text{paper only at station in } w) = -1 \]  
\[ U(\lambda w. \text{stay put in } w, \lambda w. \text{paper only at station in } w) = 0 \] etc.

Standardly, a decision problem can be represented with a decision matrix like the one below.  

<table>
<thead>
<tr>
<th></th>
<th>go to station</th>
<th>go to palace</th>
<th>stay put</th>
</tr>
</thead>
<tbody>
<tr>
<td>paper at station</td>
<td>1</td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>paper at palace</td>
<td>-1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>paper at both places</td>
<td>1</td>
<td>1</td>
<td>-1</td>
</tr>
<tr>
<td>paper at neither place</td>
<td>-1</td>
<td>-1</td>
<td>1</td>
</tr>
</tbody>
</table>

The decision matrix tells us that if the paper is only available at the station, it is the best thing to do to go to the station. If it is only available at the palace, it is the best thing to go to the palace. If the newspaper is available at both places, going here or there are equally good options. If the paper is not available at any place it is the best thing to stay put.

To make an informed choice, the agent should either get information about the actual world, i.e. where she can get a newspaper. Thereby, she eliminates rows of the decision matrix. Or, she can rule out possibilities for acting by obtaining information about the possible actions. The agent might rule out an action, e.g. because she learns that a certain act is not possible or not allowed in the actual world, e.g. if the shop at the station is closed.

To incorporate such domain goals as decision problems, several changes to the discourse model are made in the following way by Bledin and Rawlins (2019). The QUD stack \( Q \) is generalized to a goal stack \( G \) which now comprises questions and decision problems where the former represent

---

58 The value for this kind of possibility could as well have been 0, too. One might justify the assignment -1 by arguing that the outcome here is even worse, because the agent took the effort to get to some place to get the newspaper, but doesn’t get it and wasted her resources.

59 Since Bledin and Rawlins’s (2019) representation is qualitative, the numeral values do not count for much. An alternative choice for this scenario could have been to only use two values, 0 and 1. The non-optimal outcomes would then have been on a par.
the informational aspect and the latter the practical aspect. $G_c$ contains substacks $G_{Qc}$, which are the QUDs that subserve the immediate practical goal. Hence, $G_c - G_{Qc}$ gives the decision problems $G_{DP}$. As before, the stacks, now in particular the $G$ stack, i.e. decision problems and QUDs, are filtered through the context set to give the live alternatives and options.\footnote{For the formal details the reader is again referred to the original paper.}

Constraints on discourse can now be stated in a similar way as for the mere QUD structure. Agents aim to solve decision problems via questioning. Hence, QUDs and in particular their respective answers should serve the goal of resolving the immediate decision problem. In Bledin and Rawlins’s (2019) words, QUDs have to subserve decision problems.\footnote{A formal definition is given in Bledin and Rawlins (2019)[p. 41].}

“[T]hat is, the speakers should ask questions as part of strategies for achieving their underlying domain goals, where the answers to their questions can ultimately help them decide what to do in the world.” (Bledin and Rawlins 2019: 38)

But how can QUDs and their answers help to resolve decision problems? In particular this amounts to the question of how to grasp the relation between decision problems and question denotations. The link that enables the formulation of this relation is given by describing the possible outcomes of decision problems via question denotations. As I said before, domain goals can be circumscribed with the question ‘What should the discourse participants do?’ which is ‘just’ a question. We arrive at a question denotation from a decision problem with a method proposed in van Rooy (2003). The first step is to map each action that is under consideration to the set of states in which it is optimal, i.e. where it has the highest utility. This is the best action set (BAS) for actions (189).

\begin{align}
\text{Best Action Sets (BAS) Bledin and Rawlins (2019)}
\end{align}

Given a decision problem $DP = \langle A, S, U \rangle$

a. The best action set for $a \in A$ is $a^* = \{ s : U(a, s) \geq U(b, s) \text{ for all } b \in A \}$
b. The best action set for DP is $Q_{DP} = \bigcup a^*: a \in A$.

$Q_{DP}$ gives the meaning of the question ‘What should the discourse participants do?’, or, more or less equivalently, ‘What is the best thing to do?’. For each action, the BAS collects the states in which this action results in the most preferred outcome. For the example of buying an Italian newspaper (188), the BAS is given in (190).

(190)

$$Q_{paper} = \begin{cases} 
\lambda w.\text{newspaper available at station in } w, \\
\lambda w.\text{newspaper available at palace in } w, \\
\lambda w.\text{newspaper available at neither location in } w 
\end{cases}$$

For the first proposition the action of going to the station is best, for the second, going to palace, and for the third, staying put is the best action to decide for. Note that the first two propositions overlap since each action – going to the station and going to the palace – gives an outcome that is equally preferred in situations where the newspaper is available at both locations. I.e. if the newspaper is available at the station and at the palace, it doesn’t matter where the agent goes.\(^{62}\) Since there are two states that lead to an equally preferred outcome, i.e. getting an Italian newspaper, it is sufficient to give only one of these alternatives as an answer to the question ‘Where can I buy an Italian newspaper?’ if this question subserves the respective decision problem. Even if the paper is available at both places, the answer that it is available at the station suffices for a resolution. In this case, that the newspaper is available at neither location is ruled out by the asserted answer.

Solving a decision problem in discourse is defined in terms of the best action set of this decision problem. A decision problem is solved if the agent(s) have enough information so that at least one of the members of the BAS is picked out in the context at hand. E.g. if the agent learns that

\(^{62}\) Following van Rooy (2003) this overlapping constellation of alternatives is responsible for the mention-some reading of some questions.
there is no Italian newspaper, neither at the station nor at the palace, the
decision problem is solved. The two definitions in (191) and (192) give the
conditions of when a DP counts as resolved in a context and building on
this definition how information resolves a DP.

(191) **Resolved DPs** (Bledin and Rawlins 2019: 39)
   a. $DP$ is resolved iff $\bigcup S \in Q_{DP}$
   b. $DP$ is resolved in context $c$ iff $DP \otimes (cs_c \cap a_c)$ is resolved$^{63}$

(192) **Resolving DPs** (Bledin and Rawlins 2019: 39)
Given a decision problem $DP$ that is not yet resolved in $c$:
$P$ resolves $DP$ in $c$ iff $DP$ is resolved in $\langle cs_c \oplus a_c, P, a_c, A_c, G_c \rangle$

(191-a) states that a decision problem is solved in case the union of the
propositions in the state space is an element of the best action set of the
decision problem ($Q_{DP}$). I.e. if the state space, or rather the union of the
states, is narrowed down such that it chooses a member of the BAS of the
decision problem, the latter is resolved. Furthermore, the definition allows
for more than one optimal action as in the case of the Italian newspaper
where going to the station is as good as going to the palace.

The definition in (192) is analogue to complete answerhood for QUDs.
From this it is possible to derive a decision theoretic equivalent to partial
answerhood for questions. The basic idea is that information helps to
resolve a decision problem if this information rules out either a proposition
from the state space or a proposition from the action set. E.g. in the
newspaper case, giving the information that Italian newspapers are not
sold at the station helps to solve the decision problem without completely
determining the best option. Similarly, (193) does not solve the problem of
how to get to Harlem, but it rules out the possibility of going there by the
A-train.

(193) a. If you want to go to Harlem, the A-train just left.

$^{63}$ $\otimes$ is the operation of intersecting each proposition in $A$ and $S$ of $DP$ with the proposition
on its righthand side, here $(cs_c \cap a_c)$. $DP \otimes (cs_c \cap a_c)$ denotes the decision problem restricted
to the context set and possible assumptions.
b. A: What if I want to go to Harlem?
B: The A-train just left.

The formalization of partial resolution for decision problems comes with a minor complication. Not just any information that rules out propositions from the $DP$ helps to resolve this $DP$. Resolving information $P$ rules out outcomes that were considered to be optimal before the new information $P$ was learned. Information eliminating non-optimal options does not help to resolve a $DP$. Bledin and Rawlins (2019) solve this complication by first introducing the notions of ‘acts in play’ and ‘conflict states’. The former are defined as acts that are optimal in a set of states (given by the BAS). Ruling out such acts will help to resolve the $DP$. ‘Conflict states’ are states where one action in play is optimal and another is not optimal. If such a conflict state is ruled out by new information the optimal action is also ruled out. Hence, the ruling out helps to choose between the actions at hand. The formal definitions of acts in play and conflict states are given in (194).

(194) **Acts in play & conflict states** (Bledin and Rawlins 2019: 40)

Given a decision problem $DP = (A, S, U)$:

a. Action $a \in A$ is *in play* iff there is no $b \in A$ s.t. $a^* \subset b^*$

b. State $s \in S$ is a *conflict state* iff there are actions $a, b \in A$ in play s.t. $s \in a^*$ but $s \notin b^*$.

Formally, an act $a$ is *in play* if and only if there is no other act $b$ that is equally or more optimal than $a$ in the very same or even more states. Hence, it has to be excluded that there is an action $b$ in the action set $A$, so that its best action set $b^*$ is a superset of the best action set $a^*$ for $a$ (194-a). 64 If there is an act $b$ that is as optimal as $a$ in $a^*$, but optimal in more states, this act trumps $a$ which is not in play then, i.e. it doesn’t have to be considered as a relevant option for taking action.

64 Where the BASs $a^*$ and $b^*$ are sets of states.

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A conflict state $s$ is a state in $S$ where there is an optimal action $a$ and where there is some other, alternative action $b$ which is not optimal with respect to that state $s$. I.e. state $s$ is not an element of the BAS $b^*$ of $b$. If $s$ is ruled out as a live possibility, there is also no need to consider $a$ as a relevant action any more and $b$ has to be considered more optimal in these circumstances.

As indicated, that some information $P$ helps to resolve a DP is defined in (195) by the exclusion of an act in play or a conflict state from the DP in context. The condition $P \cap a = \emptyset$ expresses that there is an action in the DP in context that is not included in the proposition $P$. An update with $P$ makes it that $cs_c \subseteq P$. Consequently, the action in play $a$ is excluded from the DP in context if $P$ is learned. Similarly for the state space: information $P$ helps to resolve a DP in context if there is a conflict state $s$ in the DP that is not included in $P$ ($P \cap s = \emptyset$). Again, an update with $P$ excludes the conflict state $s$ from the context set thereby narrowing down the options for action.

(195) **Helping to resolve DPs** Bledin and Rawlins (2019)[p.40]

Given a decision problem $DP$ that is not yet resolved in $c$, $P$ helps to resolve $DP$ in $c$ iff one of the following holds:

a. $P \cap a = \emptyset$ for some action $a$ of $DP \otimes (cs_c \cap a_c)$ that is in play.

b. $P \cap s = \emptyset$ for some conflict state $s$ of $DP \otimes (cs_c \cap a_c)$.

In this section I have introduced Bledin and Rawlins’s (2019) account of What if (WIF) questions in a dynamic framework. WIF questions introduce a supposition and a felicity constraint that requires the suppositional context to be inquisitive. I.e. in the suppositional context there has to be a salient set of alternatives that needs to be resolved. In many cases satisfying the felicity constraint calls for QUD accommodation. With respect to practical needs, accommodation takes place against the background of a decision problem or practical goal that is salient in the suppositional
context. On Bledin and Rawlins’s (2019) account, decision problems have
to be understood as providing the motivation for asking questions and
exchanging particular information. I have followed their lead and went
through their implementation.

### 4.5.2 Application to bcs

Bledin and Rawlins (2019) introduced the decision theoretic machinery
to spell out one way of how QUD accommodation works. In particular,
they aim to provide an explanation of the resolution conditions of WIF
questions in suggestive uses like (196).

(196) A: Whom should we invite to the colloquium?
B: What if we invite Professor Plum?
C: He will give a syntax talk. So, we shouldn’t invite him.

Examples of this kind pose a problem for the hypothesis that the resolution
conditions of WIF question are anaphorically. The QUD ‘Whom should we
invite for the colloquium?’ cannot supply a resolution for the WIF question.
The decision theoretic account explains this case in that both, the QUD
(196) as well as the WIF question (196) subserve the domain goal of having
a good colloquium. The resolution for (196) is given by this decision
problem. The global decision matrix is given in table 4.1, where the WIF
question picks out a part of it (in bold face) and asks how things are with
respect to making the best decision. Only if Plum gives a semantics talk
he should be invited, since this makes for the optimal outcome.

<table>
<thead>
<tr>
<th></th>
<th>invite Xavier</th>
<th><strong>invite Plum</strong></th>
<th>invite McGonagall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plum semantics talk</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Plum syntax talk</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 4.1: Decision matrix
However, in the case of \textit{bc}s accommodation of QUDs is slightly different, because it is triggered by discourse mapping and NaR reasoning. Where in the Professor Plum case the pragmatic mechanism to retrieve the resolution conditions for the WIF question needed to refer back to the \textit{global} decision problem, in \textit{bc}s the decision problem is \textit{constructed} with respect to the suppositional context. Consider the \textit{bc} variant of the newspaper scenario in (197).

\begin{equation}
\text{(197) If you want an Italian newspaper, international newspapers are sold at the station.}
\end{equation}

In this case the antecedent itself indicates a decision problem \textit{in} the suppositional context and the consequent gives information that resolves this decision problem. The contrast to the Professor Plum case gets even more articulated with the packing example (175). Here we have two practical problems, a global one, i.e. to get packed, and a suppositional, local one, i.e. easing the hunger. But what allows for accommodating a new decision problem in this case? It is the interaction between the contextual assumption of independence and NaR reasoning.

The assumption of factual independence leads to the very same overall informational global update with the consequent proposition `\textit{There are biscuits on the sideboard}' like the plain assertion of this proposition. But in contrast to the plain assertion of the consequent the global update in the case of a \textit{bc} is derived as an inference. The interpreter is faced with the following question that results from informational equivalence: If it was the intention of Annette, the speaker in (175), to address the global QUD and the decision problem that it subserves, why does she use a way of conveying this information in an indirect way that has higher processing costs rather than a plain assertion. And moreover, why does she use a more complex form that contains information that is superfluous if the point of her utterance of the \textit{if}-construction was to address the global packing goal. Since there is a less indirect way to convey information that addresses the global domain goal and the subserving QUD which is also less complex,
i.e. a plain assertion with a declarative sentence, the interpreter can rule out that solely providing the global information exhausts the communicative intention of the speaker. Otherwise the speaker would have been uncooperative (or suboptimal) by exhibiting bad discourse manners and choosing suboptimal forms for conveying what she wants to convey. The interpreter has to conclude that the if-clause serves a particular function and was used for a reason. And one way to construct such a reason is to reason about practical goals in the suppositional context and how the information in the consequent relates to these goals. This kind of reasoning is facilitated by the discursive mapping. The interpreter has to infer, that the supposition serves to introduce or make explicit a potential or hypothetical domain goal that gives the resolution conditions of the WIF question ‘What if the addressee is hungry?’.

(198) spells out the process of interpretation for the packing scenario (175) within the dynamic discourse model from Bledin and Rawlins (2019). From the semantics of the if-construction in (198-a) the assumption slot is updated with the supposition in the antecedent. In (198-b) the assertion slot is updated with the consequent. In this context the decision problem on the goal stack is about getting packed and subserving QUDs like What are the things to be packed?. With the strengthening inference from factual independence (cf) the interpreter concludes that the overall informational effect of the update is global and equivalent to an assertion of the consequent alone. On the discourse level this amounts to the fact that the QUD subserving the decision problem of packing can be answered in a more straightforward fashion. This feeds into NaR reasoning. Since the standard reasons for using an if-construction for an hic reading are blocked, the interpreter has to engage in finding alternative reasons. In this case, decision theoretic accommodation does the job. In (198-e) a repair update takes place where a new decision problem about solving the hunger and its respective BAS as a subserving QUD are accommodated. I leave the subsequent steps unformalized. The proposition on the assertion stack can now be interpreted with respect to the goal stack. The BAS $Q_{hunger}$ that is roughly What food is there? as well as the entire decision problem $DP_{hunger}$
are resolved by the consequent proposition and after the acceptance step popped from the stack. As well, the restriction in the assumption slot that served to trigger the optimality inference – here, the accommodation of a new DP – is removed from the assumption slot.\(^{65}\)

(198) \(c_0 + \text{If you are hungry there are biscuits on the sideboard}\)

a. \(c_0 = \langle cs_c, a_c, \mathcal{A}_c, \langle \llbracket \text{What to be packed is where?} \rrbracket, DP\text{packing} \rangle \rangle\)

b. \(c_1 = \langle cs_c, a_c \cap \llbracket \text{Berta is hungry} \rrbracket, \mathcal{A}_c, \langle \llbracket \text{What to be packed is where?} \rrbracket, DP\text{packing} \rangle \rangle\)

c. \(c_2 = \langle cs_c \oplus a_c, a_c \cap \llbracket \text{Berta is hungry} \rrbracket, \llbracket \text{There are biscuits on the sideboard} \rrbracket, \langle \llbracket \text{What to be packed is where?} \rrbracket, DP\text{packing} \rangle \rangle\)

d. Pragmatic strengthening inference \(ce\) from factual independence:

\(c_2 \oplus \text{Repair!} = \langle cs_c \oplus a_c, a_c \cap \llbracket \text{Berta is hungry} \rrbracket, \llbracket \text{There are biscuits on the sideboard} \rrbracket, \langle \llbracket \text{What to be packed is where?} \rrbracket, DP\text{packing} \rangle \rangle\)

\(\sim \) NaR reasoning: \(hc\) reading is blocked

\(\sim \) inferring alternative reason

e. \(c_2 + \text{Repair!} = \langle cs_c \oplus a_c, a_c \cap \llbracket \text{Berta is hungry} \rrbracket, \llbracket \text{There are biscuits on the sideboard} \rrbracket, \langle Q_{hunger} \approx \llbracket \text{What food is there?} \rrbracket, DP_{hunger}, \llbracket \text{What to be packed is where?} \rrbracket, DP\text{packing} \rangle \rangle\)

Let us now consider how the inferred decision problem in context restricted by ‘if Berta is hungry’ looks like. Hunger typically gives rise to the problem for the agent of how to ease the hunger. Decision situations give rise to several different formulations of respective decision matrices. Here, I will

\(^{65}\) However, there is also the possibility that the restriction stays in place, i.e. the conversation may continue ‘within’ the supposition.
chose one kind of representation that fits best the purpose of demonstrating the role of decision problems in discourse. For the packing case we have one type of action as a solution to the hunger problem. This is the action of eating something that can be instantiated by several different, more specific actions in $A$, e.g. eating biscuits, eating a sandwich, making a pizza, going to the restaurant. What we have to assume is that the space of possible actions is somehow restricted by considerations of plausibility, feasibility and effort. However, these considerations are not captured in the decision problem in a principled way. Rather, decision matrices are post hoc to such considerations. I take the state space $S$ in this case to represent preconditions for the actions, e.g. whether there is the specific food or whether the restaurant is open and their combinations. These preconditions have to be satisfied so that at least one action can be taken. The items of the decision problem in the restricted context then are as in (199).

\begin{align*}
A &= \{ \lambda w. \text{eat biscuits in } w, \\
& \quad \lambda w. \text{eat a sandwich in } w, \\
& \quad \lambda w. \text{go to the Korean restaurant in } w, \\
& \quad \lambda w. \text{stay put in } w \} \\
S &= \{ \lambda w. \text{there are only biscuits in } w, \\
& \quad \lambda w. \text{there is only a sandwich in } w, \\
& \quad \lambda w. \text{biscuits, sandwich, restaurant is closed in } w, \\
& \quad \lambda w. \text{no biscuits, no sandwich, restaurant is open in } w, \\
& \quad \lambda w. \text{no biscuits, no sandwich, restaurant is closed in } w \\
& \quad \text{etc.} \} \\
U(\lambda w. \text{eat biscuits in } w, \lambda w. \text{only biscuits } w) &= 1
\end{align*}

\textsuperscript{66} See Cariani (2013) on an informal take on how to integrate these notions. 
\textsuperscript{67} The term ‘preconditions’ is taken from Condoravdi and Lauer (2016). I make more use of this term below.
$$U(\lambda w. \text{go to the Korean restaurant in } w, \lambda w. \text{no biscuits, no sandwich, restaurant is closed in } w) = -1$$
$$U(\lambda w. \text{stay put in } w, \lambda w. \text{no biscuits, no sandwich, restaurant is closed in } w) = 0$$

With setting up the decision problem in this way it gets clear how the resolution conditions of the WIF QUD in (175), i.e. ‘What food is there (to ease the hunger)?’, and the respective answer given in the consequent ‘There are biscuits on the sideboard’ resolve the decision problem that arises if Berta is hungry. The consequent proposition picks one of the states where the action of eating biscuits is optimal. Indeed, this leaves open whether there is another state and action whose outcome is equally optimal. All that is asked for is one optimal way of resolving the decision problem. But crucially, the assertion rules out other possibilities that might have been considered more optimal by the addressee. The relevant fragment of the corresponding BAS of the hunger problem is given in (200).

(200)

$$Q_{\text{paper}} = \begin{cases} 
\lambda w. \text{there being biscuits in } w, \\
\lambda w. \text{there being a sandwich in } w, \\
\lambda w. \text{restaurant is open in } w 
\end{cases}$$

Note that the global decision problem about getting packed still is on the goal stack. Hence, the new decision problem about easing the hunger is subordinated to the global one. The latter restricts what can be taken to be an optimal action in these circumstances. Going to the restaurant for example will be ruled out due to its negative impact on the global decision problem of packing.

In this section I have used Bledin and Rawlins’s (2019) account of WIF questions and QUD accommodation via decision problems to account for how the resolution of the antecedent QUD in bcs that allow for practical readings is inferred by interpreters. For the standard example of ‘If you are hungry, there are biscuits on the sideboard’ the inference of a hypothetical decision problem allows to construct the consequent as an answer to
the suppositional QUD ‘What is the case in the antecedent worlds with respect to things that can be used to ease the hunger, i.e. with respect to available food?’. Thereby accommodation from a (hypothetical) decision problem was shown to be able to provide the resolution for a suppositional QUD. This has the effect that the discourse constraints, relevance and congruence, forced by the mapping of an if-construction with a contextual assumption of factual independence can be satisfied.

4.6 Indicating and inferring preferences and goals

In the preceding sections I brought together the decision theoretic account of discourse from Bledin and Rawlins (2019) with Lauer’s (2014) account of mandatory implicatures and the QUD account of if-constructions from Biezma and Goebel (2019). With this, a major mechanism is spelled out of how the consequent of a bc is interpreted as a relevant, i.e. resolving answer to the suppositional question set up by the antecedent. I have applied the mechanism to the packing scenario (175) where the if form served to make clear that a different decision problem from the global one is addressed with the information in the consequent. Yet, the worry looms that the account given is not general enough. It is clearly not the case that bcs are only used as disambiguating forms. Obviously the utterance of ‘If you are hungry, there are biscuits on the sideboard’ can be discourse initial which is different from the packing case. With respect to this worry, the reply is that also in this case the if-construction is used to indicate and make explicit for which purpose the information in the consequent is given. However, a further concern looms. What is not explained in the decision theoretic account by now is where the decision problem in the suppositional context comes from. I.e. the question is how the interpreter infers this decision problem. Indeed, this process of identifying a decision problem is not unconstrained. In section 4.6.1 I show that, first, there are variants of bcs where decision theoretic features are encoded semantically and, second, that in other examples this information is inferred from lex-
ical items in interaction with general world knowledge or, third, based on particular contextual knowledge. With this, it is possible to make a taxonomic difference between three kinds of *bc*s that engage the decision theoretic accommodation mechanism.

By introducing the decision theoretic account I held out the prospect to account for the illocutionary inferences that are associated with paradigmatic cases of *bc*s. Remember that in chapter 2 it was pointed out that this inference is not obligatory and not definitional for a *bc* reading of *if*-constructions and a pragmatic account of *bc*s should be able to explain this non-obligatory character of illocutionary inferences like in (201).

(201) If you are hungry, there are biscuits on the sideboard.

$\rightarrow$ suggestion to take/eat the biscuits

To account for this inference I suggest to adopt a similar mechanism to the one suggested by Lauer and Condoravdi (2014) for anankastic conditionals. They observe that *if*-constructions like ‘*If you want to go to Harlem, you have to take the A-train*’ give rise to a very similar inference of giving advice. Lauer and Condoravdi (2014) go on to argue that this inference is, first, not obligatory, and second, not due to the semantics of anankastic conditionals but due to how the information conveyed in an anankastic conditional relates to practical reasoning. As I argue, this carries over to those *bc*s where an illocutionary inference can be observed.

Another issue about the illocutionary inferences in a major class of *bc*s is that there is a restricted variety of inferences: suggestion, command, advice. This class of inferences is a subclass of flavors that we also observe in imperatives, see Condoravdi and Lauer (2012). The latter argue that the difference of illocutionary inference is due to how the preferences or utilities of speaker and hearer align. One factor being whether there is a power asymmetry where the speaker alone decides on the preferences to adopt (e.g. parent - child: command inference). With the decision theoretic picture and the relation to practical reasoning, the same perspective applies to *bc* readings.
The alignment of individual preferences also makes headway towards answering the question of which Bcs receive a practical interpretation. In the preceding section 4.4.2 I have shown how the decision theoretic picture allows to explain how the consequent can resolve the question set up by the antecedent. The decision problem that figures in that explanation is, however, post hoc. I.e. what figures in the explanation of the resolution is a structure that the participants somehow have agreed about. But, the utterance of a practical Bc does not only refer to a decision problem, but figures in setting it up. It helps fixing the preferences. And how those preferences are fixed is dependent on how the individual preferences of speaker and interpreter align. This explains that the utterance of ‘If you are hungry, there are biscuits on the sideboard’ in the packing scenario (175) serves as a device of bargaining: Annette conveys that she is willing to accept the eating of the biscuits (or an action on a par with this option). But she rules out the possibility to go to the Chinese restaurant, even though Berta might prefer this option. For Annette this alternative is ruled out because it conflicts with her own interest of getting packed. That the utterance of a Bc facilitates coordination on preferences is not represented in Bledin and Rawlins’s (2019). Their framework rather sets in when the decision problem is already mutually accepted.

The overall argumentative structure of this section is to first give some justification for the decision theoretic picture in discussing linguistic and contextual cues. My major point is that in some Bcs the reference to utilities or preferences is semantically encoded. Here, I take cues from Condoravdi and Lauer’s (2016) work on anankastic conditionals. The parallel between the two constructions that I make out is that the interpretation of antecedents of practical Bcs is quite analog to the interpretation of antecedents in anankastic conditionals. Theoretically from this springs the fact that both kinds of if-constructions are able to generate additional inferences via practical reasoning. The role of preferences in Bcs that receive a practical interpretation and their role in imperatives allows to treat the
variation of force in bcs in a similar way. The general line of argument is that for a large class of bcs mechanisms apply that are not unique to them, i.e. bc interpretations fit into broader categories. Hence, the (illocutionary) inferences that are associated with bcs are not special.

### 4.6.1 Lexical information, general world knowledge and contextual variation

Decision problems as introduced into the formal model in 4.4.2 have to be inferred by the interpreter somehow. In the preceding section I described the abstract mechanism where factual independence, form, discourse mapping and NaR reasoning together lead to the inference of a new decision problem. However, this interaction of mechanisms does not claim anything about the content of the decision problem. Under the hypothesis that decision problems are always implicit in discourse, without any restriction there is a vast array of decision problems that could have been meant. Clearly, the inference of the content of the decision problem is somehow restricted. In the following I aim to show which factors may guide this kind of inference. In doing so, I also provide some evidence that practical bcs are indeed interpreted relative to decision problems and respective utility or preference functions.

Austin’s (1956) original example (202), first, is very instructive for what may guide the inference to a decision problem, and second, provides evidence for the practical dimension.

(202) There are biscuits on the sideboard, if you want them.

The important feature is the volitional verb ‘want’ in the antecedent. With this (202) patterns with so-called anankastic conditionals (203) and a subgroup of conditional imperatives (204).

(203) a. If you want to go to Harlem, you should / have to take the A train.
b. If you want to have the workshop dinner at your place, you should buy a bigger dining table.

c. If you want to invite everyone to the dinner, your table has to seat at least 20 people.

d. If you want to travel to that place, you should get a vaccine.

e. If you want to eat something, you should take some biscuits.

(204) a. If you want to go to Harlem, take the A train.

b. If you want to have the workshop dinner at your place, buy a bigger dining table.

c. If you want to eat something, take some biscuits.

The defining property of anankastic conditionals is that they give rise to the implication that the prejacent of the modal in the consequent is a necessary means to fulfill the (hypothetical) goal stated in the antecedent. There are subtle differences between if-constructions like (203) and (204) that are carefully fleshed out in Condoravdi and Lauer (2017). However, these differences are not directly relevant for the point I’d like to make here.

Note that (203-e) and (204-c) are ways of spelling out the inferences that arise with a bc like (205).

(205) If you want to eat something, there are biscuits on the sideboard.

My hypothesis is that the tight relation between anankastic conditionals like (203-e), conditional imperatives like (204-c) and bcs like (205) are due to a factor that is explicitly given in these examples by the volitional verb ‘want’ in the antecedent. This hypothesis builds on Condoravdi and Lauer’s (2016) account of anankastic conditionals where it is argued that ‘want’ plays an essential role. Their account of anankastic conditionals is that these constructions have an inferential profile where “[t]hese conditionals uniformly assert that the prejacent is necessary, given the hypoth-

68 (203-a) - (203-d) taken from Condoravdi and Lauer (2017).
69 (204-a), (204-b) taken from Condoravdi and Lauer (2017).
esis about preferences made with the antecedent” [p. 46]. The means-of-implication that is central to anankastic readings is derived pragmatically as an inference on this account. This anankastic reading is not semantically encoded, since on Condoravdi and Lauer’s (2016) account, the necessity modal is not semantically restricted by the antecedent. Rather, that the prejacent is interpreted as indicating a necessary means for achieving the goal in the antecedent is a consequence of a sense making inference, i.e. NaR-reasoning, just like in bcs.

“The addressee may ask himself why it would be the case that the [anankastic conditional] is true: Why, if he has a certain preference, all worlds in which he optimally fulfills his preferences will be such that a certain q is true? One plausible answer – in the Harlem case, but not in others – is that q is a necessary precondition for fulfilling the preference (together with his other preferences).” (Lauer and Condoravdi 2014: 603)

That a hypothesis about preferences is made with the antecedent is due to ‘want’, or, equivalently, the use of verbs such as ‘intend, plan, having the goal’. Condoravdi and Lauer (2016) develop a semantics for ‘want’ where its interpretation is relative to a preference structure, i.e. roughly an ordering of propositions regarding how much an agent prefers each proposition to be realized. A preference structure is indexed to an agent, e.g. in the case of (205) it is the hypothetical preference structure of the addressee that is targeted by the antecedent because of the personal pronoun ‘you’. The second ingredient for the semantics of ‘want’ is that the prejacent of ‘want’, ‘addressee eats something’, is claimed to be maximal with respect to this preference structure. The respective entries are given in (206) and (207).

(206) \( \text{want}_p(a, \llbracket \phi \rrbracket) \) is true in \( w \) iff \( \llbracket \phi \rrbracket \in \max[\mathcal{P}(a, w)] \) \(^{70}\) (Condoravdi and Lauer 2016: 33)

\(^{70}\) \( \mathcal{P}(a, w) \) is a preference structure for agent \( a \) in a world \( w \). Note that I here leave the dynamic paradigm and return to a static representation. However, preference structures are e.g. claimed to be part of a context structure by Murray and Starr (2018). It is left for future work to implement the insights of this chapter into a dynamic formal framework along these lines.

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(207) \( \max(\{P, \prec\}) = \{P \in P | \exists Q \in P : P \prec Q\} \), where \( P \) is a set of propositions and \( \prec \) is an ordering relation (Condoravdi and Lauer 2016: 33)

Preference structures in this sense are very general. Agents in general are subject to a whole variety of desire-like attitudes and constraints: plain desires, wishes, inclinations, moral codes, obligation, laws etc. These constraints have different degrees of importance but each of them can be represented by a separate preference structure. These preference structures may be incompatible and inconsistent with each other, e.g. an agent may have the desire to eat chocolate but at the same time the resolution to eat less sugar. Certainly, having these incompatible preferences the agent cannot decide for an action. She has to decide which of these preferences she considers to be more important. I.e. to being able to act the agent has to arrange and combine her multiple underlying preference structures into a unified preference structure which is subject to a consistency constraint (208).

(208) A preference structure \( \langle P, \prec \rangle \) is consistent iff for any \( X \subseteq P \), if \( \bigcap X = \emptyset \), there are \( P, Q \in X \) such that \( P \prec Q \). (Condoravdi and Lauer 2012: 45)

(208) requires for any pair of propositions in the structure with underlying domain \( P \) that if the propositions do not intersect they have to be strictly ordered by the ordering relation. Such a consistent preference structure is called effective preference structure by Condoravdi and Lauer (2016) and is (more or less) equivalent to the ordering that results from a utility function over outcomes in Bledin and Rawlins (2019) that I have used in section 4.4.2. Condoravdi and Lauer (2016) argue that an if-construction with an indication of a goal in the antecedent, e.g. by ‘want’, receives an anankastic reading with a means-of-implication only if ‘want’ is interpreted relative to an effective preference structure. For the example (203-a) the anankastic interpretation then is that taking the A train is necessary for going to Harlem.
With respect to practical bc's I want to emphasize that the antecedent has the same role as in anankastic conditionals, i.e. indicating a hypothetical goal as an effective preference. This is borne out by example (209) that, like Austin’s bc (202), shares the structure of the antecedent with anankastic conditionals.

(209) If you want to eat something, there are biscuits on the sideboard.

In these cases, like in anankastic interpretations, the consequent is interpreted relative to the hypothetical effective preference. This establishes that ‘want’ and similar ‘desire’ predicates represent one class of lexical items that guide the construction of a hypothetical goal. But certainly, not every bc contains such a predicate. This is e.g. the case for the paradigmatic example (210).

(210) If you are hungry, there are biscuits on the sideboard.

Notably, this is also the case for anankastic conditionals. Anankastic interpretations do not necessarily need a ‘desire’ predicate as witnessed by (211).

(211) If you are hungry, you should eat something.

On my take, what happens here is that general world knowledge e.g. about which sensations typically lead to which effective preferences serve as the basis for making the inference from what is stated in the antecedent to a hypothetical goal. E.g. in the hunger case the inference is something like hunger \( \rightarrow_{\text{gwk}} \) preference to ease the hunger, where \( \rightarrow_{\text{gwk}} \) represents a default and defeasible inference from general world knowledge (hence gwk). Indeed, all bc's that can be interpreted as practical bc's offhand contain lexical material that allows to infer typical goals via such a mechanism. E.g. if somebody suffers, we typically infer that suffering is a negative state that the person wants to get out of.

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(212) If you are suffering from depression, Friend’s hospital is conducting a study of an investigational medication. (Siegel 2006: 180)

(213) If you need me, I’m home all day.

(214) If you desperately crave for sweets, the is chocolate in the kitchen.

(215) If you need anything, my name is Jill.

(216) If you want to see some artistry, [performs a handstand].

From each antecedent it is easy to infer something about the effective preferences of the addressee in the suppositional context. This inference facilitates the construction of a decision problem as it was used in the formalization in section 4.4.2.

Csipak (2015) classifies bcs either as problem-solving or discourse-structuring. (212) - (216) qualify as problem-solving bcs because it is the content of the consequent that is related to the hypothetical context. In discourse-structuring bcs it is rather the utterance or the form of the consequent that is related to the hypothetical context like (217).

(217) If I am being frank, you look tired.

In a way these are bcs that fit into the conditionalized speech act paradigm: *If I am being frank, I utter you look tired*. It is a question for future research whether such discourse-structuring bcs can be accommodated in the theory that I have presented. The working hypothesis is that another layer of pragmatic enrichment comes in with this kind of bcs. However, there is a class of subexamples where it is the form of the consequent that is relevant for the interpretation. And these cases can be analyzed in the framework presented here. In those examples, (218) - (221), *verba dicendi* 71 See Biezma and Goebel (2019) on this issue.
and similar combinations of ‘desire’ predicates and predicates that relate
to communicative actions provide cues that guide the construction of ef-
fective preferences which are about selecting a communicative action or
an utterance with a certain form.

(218) If they ask you how old you are, you are four.
(219) If I may say something irrelevant, I have to pick up my daughter
now.
(220) If you want to hear a big fat lie, Trump is secretly married to
Oprah.
(221) If you want to hear a piece of nonsense, gabbabarrtgaar.

In each case, the antecedent gives rise to the need to infer an effective pre-
ference about a communicative or linguistic action by selecting a message
and its content. E.g. (218) gives rise to the goal of uttering something to
answer the question. The consequent indicates what the content of this ut-
terance should be. Also here, we would need an additional inferential layer
to come to this conclusion. However, the decision theoretic picture also
plays a role here: if somebody is asked something, we can infer that there
is a decision problem of how to react to this act of questioning. Thereby,
these if-constructions can also be interpreted in a very similar manner as
(212) - (216) by relating the consequent to inferred effective preferences
from the hypothetical context.

In any of the cases of (212) - (216), (218) - (221) and especially (210) there
is a lexical trigger that ‘activates’ general world knowledge about which
effective preferences agents typically have. However, this information is
only used by default. Contextual information can override these defaults.
In one class of these overriding cases, the denotation of the ‘desire’ pre-
dicate (‘want’) is relative to just a plain preference structure, not an effective
preference structure.

(222) If you want to eat chocolate, you should try thinking about some-
thing else. (Condoravdi and Lauer 2016: 2)
(223) If you want to smoke a cigarette, your Sudoku book is on the coffee table.

(224) If you get hungry, the doctor’s number is jotted on the prescription. (Biezma and Goebel 2019: 20)

(222) is not a \textit{bc} but rather a relative to anankastic conditionals with a modalized consequent. However, ‘\textit{want}’ is not interpreted as indicating an effective preference. Rather it indicates a plain preference, a mere desire. Condoravdi and Lauer (2016) argue that because of this (222) is not a real anankastic conditional. This is since what is conveyed is clearly not that thinking about something else is necessary for eating chocolate. The relation between the content of consequent and antecedent can not be construed as a means-of-relation.

Still, the pragmatic and practical reasoning is very similar to what is observed in real anankastics. The prejacent of the modal in the consequent – thinking about something else – is interpreted a means \textit{to overcome} the desire to eat chocolate. This is the practical goal/decision problem in the suppositional context. What becomes clear with this example is that, though the effective preference is not explicitly stated, reasoning about the practical domain goal on the discourse level is also present in (222). And this reasoning is due to the role of domain goals in discourse, i.e. it is triggered by general pragmatic principles. The goal of overcoming the desire has to be \textit{inferred} on the basis of specific information about the context. This information comprises that the mere desire to eat chocolate gives rise to the effective preference of the agent to resist this desire by a distracting activity. The contextual information that figures in this interpretation might for one thing be that it is common ground that the speaker is on a diet, or, that there just is no way to get hands on a piece of chocolate. For another thing, the information in the consequent also plays a crucial role since via \textit{general world knowledge} it cannot constitute a means to achieve the goal of eating chocolate.
The very same holds for the bcs in (223) and (224). The contents of the consequents do not present preconditions to achieve a goal or satisfy an effective preference that is made explicit in the antecedent. That this cannot be the case is an inference from default generalizations about how specific preferences can normally be satisfied.

Different interpretations are possible here. The one from general world knowledge for (223) is that the addressee might want to stop smoking and distract herself with a sudoko. However, contextual information may override this inference: e.g. the consequent of (223) can be interpreted as information that helps to satisfy the preference of smoking if it is mutually shared information that Grandpa hides his cigarettes in the Sudoku book, or, that he always puts his cigarettes near to the Sudoku book. In each case, the decision problem is inferred differently due to contextual information. But, generally, some decision problem is inferred.

(224) is a bc that needs a specific context. Certainly, the suggestion made is not that the addressee eats the prescription paper to ease her hunger. The required context is e.g. that a patient was given a specific drug. The therapy can only be continued when the patient gets hungry, but it is not clear when this will be. The nurse sends him home and gives instructions how to proceed by uttering (224): the patient has to call the doctor when he gets hungry. To arrive at this interpretation, the speaker of the if-construction has to assume that it is common ground that knowing the telephone number of the doctor is a precondition for acting in this way.

It seems a little redundant to emphasize that contextual information about which specific preferences an agent will have in a particular situation plays a major role in triggering inferences that are tied to domain goals, particularly in bcs. However, examples of such contextual bcs ((223) and (224)) are not discussed in the standard literature or not identified as bcs. Here is another example. Sano and Hara (2014)[p. 86] note that independence can only be a sufficient condition for an if-construction to count as a bc, because there are if-constructions like (225) that satisfy the criterium of independence but are not felicitous bcs.
If France is hexagonal, there is beer in the fridge.

Contrary to Sano and Hara’s (2014) claim that (225) is an infelicitous *if*-construction and hence not a *bc*, on the pragmatic theory presented here (225) qualifies as a *bc*. This is so because antecedent and consequent satisfy factual independence. Because of this, in general, an interpreter confronted with an utterance of (225) can in most cases conclude that there is beer in the fridge, *even if* this interpreter cannot make sense of the used form of an *if*-construction. If she cannot make sense of the conditional form, the utterance will not give rise to inferences, e.g. of preference satisfaction or of suggestion. Rather, the interpreter will ask about why the antecedent is relevant here. Whether the utterance of this *bc* is felicitous or not is a matter of whether the consequent can be interpreted as an answer to the suppositional QUD from the antecedent. Indeed, not every context allows for such an interpretation, especially not *out of context*.

Importantly, in contrast to cases like the paradigmatic *bc* (210) the antecedent in (225) does not give rise to a default inference of what agents normally effectively prefer in the hypothetical situation. This is similar to the cases (222) - (224), where the goal is left implicit and contextual factors of the specific utterance situation, not only general world knowledge, guide the interpreter in inferring the goal. Indeed, (225) can be interpreted as a full-fledged *bc* with inferences about preference satisfaction *in the right context*. One possible such context is one where speaker and addressee have a bet about the shape of France. The addressee claims that it is hexagonal. With the utterance of (225) in this context the speaker offers a beer as reward if the claim of the addressee is right. If enough information about a potential goal is provided, the *if*-construction in (225) can be interpreted as a felicitous *bc*. In this case not only the factual independence requirement is met, but additionally the general pragmatic constraints on the discourse level can be satisfied.

There are more examples of *bcs* like (225) that work in a similar way, i.e. where particular contextual information that is shared by the discourse participants facilitates the relevant inferences. Consider (226).
If the virus breaks out, the rifles are in the shed.

(226) gives rise to a quasi-command inference in the following scenario: There is a virus that transforms humans into zombies. Some people in the vicinity of a farm might be infected. Hence, the domain goal is not to get infected. A possible action that achieves this goal is to shoot the zombies. Having rifles at hand is a precondition for shooting. Hence, uttered by the head of the farm (226) serves as a command to get the rifles and shoot the zombies in case the virus breaks out.

With the blocks of examples (212) - (221) and (223) - (226) it is possible to draw a difference between three kinds of practical \textsc{bcs}: first, anankastic \textsc{bcs} where the suppositional goal is indicated by lexical material, i.e. desire predicates that receive an effective preference interpretation; second, default \textsc{bcs}, where the relevant inferences regarding goals are facilitated by general world knowledge about normal preferences of agents guided by conceptual knowledge about lexical material, and third, contextual \textsc{bcs} where those inferences rely on very specific contextual information. However, these differences are not essential in that the boundaries between the categories are quite vague. The basic mechanism of setting up an effective preference or domain goal for the hypothetical circumstances and interpreting the consequent as a precondition on satisfying this goal in a certain way holds for anankastic, default, as well as for contextual \textsc{bcs}.

In this section I tried to show which cues interpreters can use to infer practical goals for a suppositional context when faced with the utterance of a \textsc{bc}. This was facilitated by a comparison to antecedents of so-called anankastic conditionals, where the indicated goal is explicitly stated with a volitional verb like \textit{want}. Indeed, the same lexical material can be observed in some \textsc{bcs}. In other cases, the practical goal is inferred from general or specific world knowledge. These observations strengthen the point of section 4.4 and show that many \textsc{bcs} can and do receive a practical interpretation that is spelled out as solving a decision problem.
4.7 Illocutionary inferences and practical reasoning

In the preceding section 4.6.1 I focussed on the role of the antecedent in anankastic conditionals and \( \text{bcs} \). In both constructions the antecedent is indicating either an implicit or an explicit effective preference, where implicitness comes in different degrees, either via general world knowledge or specific situational knowledge. My hypothesis about the interpretation of the consequent in \( \text{bcs} \) is that, similar to anankastic conditionals on Condoravdi and Lauer’s (2016) account, the information in the consequent is interpreted as a \emph{precondition} on the fulfillment of the preference structure indicated with the antecedent. Furthermore, this gives rise to illocutionary inferences like giving advice in anankastic conditionals and giving suggestions in \( \text{bcs} \). But how exactly do these inferences arise? To get a grip on this question, I first summarize Condoravdi and Lauer’s (2016) account of why and how anankastic conditionals are standardly used to give advice. Then, in a second step, I try to work out how this carries over to \( \text{bcs} \) and also how these inferences are different from the ones in anankastics.

4.7.1 Another parallel between anankastic conditionals and \( \text{bcs} \)

Condoravdi and Lauer’s (2016) general focus are “conditionalized modal statements whose antecedents concern a preferential attitude of an agent” (Lauer and Condoravdi 2014: 584). They argue that anankastic conditionals with a means-of-implication (227) are only a subclass of this class of conditionals. Other members are e.g. (228), (229) and (230).

(227) If you want to go to Harlem, you should take the A-train.

72 Indeed, Lauer and Condoravdi (2014) argue that not even all conditionalized modal constructions are like this. The constructions can also be about preferential consequences, i.e. what necessarily follows from having a certain preference.
If you want to invite everyone to the dinner, your table has to seat at least 20 people. (Lauer and Condoravdi 2014: 18)

If you want to travel to that place, you should/must get a vaccine. (Lauer and Condoravdi 2014: 18)

If you want to eat chocolate, you should try thinking about something else. (Lauer and Condoravdi 2014: 2)

Examples like (228) force an analysis of anankastic conditionals where the consequent states a necessary precondition for the fulfillment of the preference in the antecedent. The standard means-of-implication is only one kind of several different kinds of preconditions. For (229) and (230) the difference to the full means-of-implication like in (227) is that context has to add something about the preferences. Getting a vaccine is not a means to travel, but it is a means to travel safe. The preference for safety has to be added contextually. For (230) the entire effective preference has to be provided contextually, i.e. that the addressee is on a diet that forbids eating sweets. I.e. the means-of relation does not hold directly between consequent and antecedent as in (227). Having a table that seats at least 20 people is not a means to invite everyone to dinner. Rather, it is a precondition for doing so. Hence, the notion of a necessary precondition is broader than and encompasses the means-of relation.

What unifies all of (227) and (228) - (230) is that (i) the consequent is modalized, (ii) it is interpreted as some kind of precondition to satisfying the explicit or implicit preference, (iii) it is standardly used to give advice. (i) is a hard linguistic fact, whereas on Lauer and Condoravdi’s (2014) account (ii) is a consequence of a sense-making NaR inference (Lauer and Condoravdi 2014: 603). I.e. the interpreter constructs a reason for why the if-construction at hand is uttered, i.e. why all the worlds where the antecedent is true are worlds where necessarily the consequent has to
be true, too. Lauer and Condoravdi (2014) go on to argue that (iii) is a consequence of general *practical instrumental reasoning* about preference satisfaction that can also be seen in non-conditionalized, cross-speaker examples like (231).

(231) A: I want to go to Harlem.
B: (Then) You have to take the A-train.

The instrumental reasoning that leads to A interpreting B’s utterance as an advice to fulfill her goal is reconstructed by Lauer and Condoravdi (2014) with the schema in (232).

(232) Lauer and Condoravdi (2014)[p.600]

a. Some agent *a* has an effective preference for *p*.
b. *a* is indifferent about *q*.
c. *a* learns that *q* is a necessary precondition for *p*.
d. *a* believes that *q* is realizable (and under *a*’s control)
   \[ \Rightarrow \]
e. *a* forms an effective preference for *q*.

Via this reasoning, the utterance of B in (231) is interpreted as an advice, i.e. the proposal that A adopts an effective preference for taking the A-train. The information conveyed by an utterance of an anankastic conditional feeds into the practical reasoning scheme which is given independently. I.e. that speakers can give advice with anankastic conditionals is not encoded conventionally but due to how the information in anankastic conditionals relates to practical reasoning about how to achieve a goal.

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73 Lauer and Condoravdi (2014) subscribe to the dynamic perspective on practical reasoning as advocated by e.g. Bratman (1987) a.o., where practical reasoning is understood as an update process to an agent’s cognitive state which typically results in an intention. This contrasts with the normative view, where the conceptualization is rather like in logical deductions and where the conclusions follow from the specific normativity of the contents. Schemata like (232) are well known in philosophy as practical syllogisms or practical syllogism reasoning.
My observation is that, similarly, in (233), where B’s answer is *not* modalized, the utterance of B is interpreted as a suggestion or an advice to take the A train. Indeed, the same can be reformulated for the *bc* in (233-a).

(233)  
A:  I want to go to Harlem.  
B:  The A train leaves from platform C.  
a.  If you want to go to Harlem, the A-train leaves from platform C.

(233) is the *bc*-equivalent to (231). The inferential effect with respect to the practical reasoning in the background is quite similar. However, intuitively, there seems to be a difference in how this inference is arrived at. Hence, a major question is how to pin down this difference. It will become evident that this task is quite difficult to come by.

Let us compare the paradigmatic *bc* (234-a) and an anankastic conditional (234-b) that makes the inference of the *bc* explicit.

(234)  
a.  If you are hungry, there are biscuits on the sideboard.  
b.  If you are hungry, you should eat a biscuit.

First of all, the conclusion of a reasoning scheme for practical *bcs* is *not* adopting a preference for the consequent, but adopting a preference for an implicit proposition that the consequent is a precondition for. In the case of (234-a) that the addressee *eats* a biscuit.

For practical reasoning with a *bc* there is an obvious difference with respect to (232-d) of the anankastic scheme. It is not taken to be realizable by and under the control of the addressee that there are biscuits, but that she eats biscuits. Only actions are feasible in this respect. This feasibility condition is dependent on there being biscuits, i.e. that a particular action is realizable is something that is learned from the utterance of (234-a).

With (234-b) it is conveyed that taking a biscuit is a necessary precondition for *optimally* fulfilling the goal indicated in the antecedent. The necessity character of this relation is determined by the necessity modal in the consequent in an anankastic conditional. This is different in the *bc*
(234-a). Can we say that there being biscuits is a necessary precondition for easing the hunger? What we can say is that there being biscuits is a necessary precondition for taking biscuits and that taking biscuits is one way of solving the suppositional hunger problem. Yet, eating a biscuit is only one possible way of easing the hunger. In a way, the speaker does not exclude other options to fulfill the goal.

What is missing in the reasoning is that eating a biscuit is a necessary precondition to ease the hunger. Rather, to eat something is a necessary precondition for fulfilling the goal, and eating a biscuit is an instantiation of eating something. With the missing necessity character, it is not semanticized that the indicated proposition, i.e. to eat a biscuit, is optimal. Hence, it is not clear why the addressee should form a preference for this proposition. In due course, I address this issue and argue that this is an inference from the principle of cooperation.

How to conceive of the practical reasoning scheme that is involved in the interpretation of (234-a) then? (235) is the best that I can come up with here.

(235) a. Some agent $a$ has an effective preference for $p$ (easing the hunger).
   b. $a$ is indifferent about $r$ (eating biscuits).
   c. $q$ (there are biscuits) is a necessary precondition for $r$ (eating biscuits).
   d. $r^*$ (eating something) is a necessary precondition for $p$ (easing the hunger).
   e. $a$ learns that $q$ (there are biscuits).
   f. $a$ learns that $r$ (eating biscuits) is realizable via (235-c).
   g. $r$ is a realizable option to satisfy $p$.
      $\rightsquigarrow$
   h. $a$ forms an effective preference for $r$ (eating biscuits).
The difficult thing to account for is the indirectness of the inference. What has to be assumed is that (235-c) and (235-d) are given by world knowledge and the instantiation relation between \( r \) and \( r' \) by analytical knowledge. But what is in the end missing is an explanation for (235-h), i.e. of why the agent should adopt a preference for eating biscuits. This is indeed a throwback since the prospect of the comparison to anankastic conditionals was to explain this feature of \( \text{bc} \). The problem is that eating biscuits is just one amongst many options to solve the hunger problem. Why should the addressee form a preference for this option? After all, the utterance of the \( \text{bc} \) is rather a proposal to adopt the preference for eating biscuits than that it forces the addressee to adopt it. Because of the indirectness, the force of \( \text{bc} \) seems to be weaker, i.e. the conclusion is not necessitated as in anankastic conditionals.

Let’s consider anankastic conditionals again. What is conveyed with an anankastic conditional is that, “[g]iven what the speaker knows, if [the addressee] effectively prefers to go to Harlem, then [the addressee’s] effective preferences will not be optimally realized unless [the addressee] takes the A train.” (Lauer and Condoravdi 2014: 592) First, note that it is the addressee’s overall preferences, not only the single preference to go to Harlem, that should be satisfied optimally. Since the speaker only has restricted knowledge about the hypothesized effective preferences of the addressee, she has to fill in the other preferences via assumptions from different sources. I.e. since the addressee is at the train station, that she has a preference to go by train, that she would like to get to Harlem without any detours and in an efficient way, etc. Second, the necessity modal indicates that its prejacent in the consequent is necessary to fulfill these preferences. By that reasoning, taking a taxi is not an optimal way to satisfy the (hypothesized) preferences of the addressee from the perspective of the speaker.

With the modal it is conveyed that without this precondition being fulfilled, the preferences cannot be satisfied optimally. In anankastic conditionals there cannot be other optimal options. A follow-up with a different consequent like in (236) is not possible.
If you want to go to Harlem you have to take the A-train.
   a. #But you have to take a taxi. 74
   b. And you have to walk to the station from here.

If you are hungry there are biscuits on the sideboard.
   a. But there is also cake in the kitchen.
   b. But if you want something savory there is pizza in the fridge.

In contrast, follow-ups that indicate other options are possible in $bc$s as witnessed by (237). This might also give a characterization of the difference between advice and suggestion: suggestions only point out an option, where advice gives information about the best option. Anankastic conditionals cannot leave room for alternative options.

However, optimality is still present in practical $bc$s. It is not forced like in anankastic conditionals via a modal, but optimality in $bc$s is an inference from the Gricean principle of cooperation. By cooperativity, the speaker should indicate the optimal solution from her perspective. I.e. as for anankastics the speaker has to hypothesize an effective preference structure and has to indicate the best option with respect to this structure. But cooperation with respect to preferences and goal achievement is constrained. The speaker cannot indicate an option that is incompatible with her own effective preferences. Being cooperative does not amount to giving up the speaker’s own interests and preferences. Hence, the individual preferences of the speaker also have to be taken into account. The action that the speaker indicates with a practical $bc$ presents the upper bound of what she can offer in light of her own preferences. Consequently, a practical $bc$ not only serves to solve a problem indicated by the antecedent but to coordinate on the licit options from the perspective of the speaker.

Condoravdi and Lauer (2012) suggest a weakened cooperation principle with respect to preferences: “If you truly do not care whether G, and you know that someone else prefers G, then act as though you prefer G, as well.”

74 ‘#’ indicates that the utterance is infelicitous.
An agent $A$ is cooperative-by-default iff he adds any topical goal $G$ of another agent to his effective preference structure, such that for any preference structure $P(a, w)$: for no $P \in P(a, w): P \prec G$.

But this in turn means that the speaker will not allow any option whatsoever that allows to satisfy the goal of the addressee. In particular she will not adopt a preference for an action (taking the A-Train, eating biscuits, going to the restaurant) that clashes with her own preferences. For the packing case (175), since Annette is committed to packing, she will not and cannot adopt a solution to the hypothetical hunger problem that clashes with her preference to get packed. As a consequence going to the Korean restaurant, a solution that might be more preferred by Berta, is out of the question.

As said, in a bc the antecedent only indicates one specific preference like wanting to ease the hunger. But the speaker has to make even more assumptions about the effective preference structure of the addressee, taking into account her own, i.e. the speaker’s preferences. There is a range of possible options to ease the hunger, i.e. having a sandwich or going to a restaurant. But with the procedure of alignment, i.e. checking for compatibility with her own preferences, the speaker indicates what is compatible with her own preferences and might from this perspective be optimal to solve the addressee’s problem. Eating the biscuits is the most concession that Annette can make in the packing scenario. Eating the biscuits is the optimal option regarding what the speaker knows about the preferences of the addressee and about what the speaker is able to concede.

If the speaker doesn’t indicate something to the contrary e.g. by giving information about other options as in (237), the optimality inference will go through. The process of aligning the speakers preferences for the sake of coordination and guided by the principle of cooperation by default rules out possibly better options from the perspective of the interpreter. But this not necessarily nails down one option as the best option as is the case for anankastic conditionals.
By this reasoning, the conclusion of the practical reasoning scheme (235-h) is indeed the adoption of a preference for eating biscuits. However, the conclusion is weaker than the one in anankastic conditionals since it is indirectly arrived at by cooperativity and coordination and not via a necessity modal.

Certainly, Berta could reply with the statement in (239).

(239) Thank you. But I have diabetes. Are there carrots in the kitchen?

Though Berta is able to go through the practical reasoning that the speaker triggers, she conveys that she cannot form the effective preferences that is the conclusion. This is due to the fact that one of the premises, i.e. (235-b), that the speaker build upon, does not hold. Berta is not indifferent with respect to eating biscuits, but has a negative preference due to her diabetes. The possibility of the reply in (239) hence is not counterevidence to the overall strategy of accounting for illocutionary inference via practical reasoning.

To sum up, though I cannot offer here a neat practical reasoning scheme for BCs, I think the overall strategy to account for inferences about practical matters via a similar mechanism like in anankastic conditionals is worthwhile pursuing. It needs, however, more elaboration and additional conceptual work. One aspect that needs refinement is the notion of a precondition. I have referred to Condoravdi and Lauer (2016) who make use of the notion of a precondition to analyse anankastic conditionals.\textsuperscript{75} In anankastic conditionals the precondition is realizable and under the control of the agent. However, in BCs the precondition is realized and not under the control of the agent. Intuitively, it makes good sense to conceive of the consequent proposition in a practical BC as a precondition, too. But this kind of precondition is more remote than in anankastic cases. It is a precondition to acting in a specific way, and this indirectly indicated action is a way of satisfying the decision problem indicated by the antecedent.

\textsuperscript{75} See also Kasper (1992) for another instructive use of this notion for an analysis of subjunctive conditionals.
Hence, it seems that this is a different kind of precondition, i.e. a precondition that the addressee has no control over. Making this more clear and evaluating whether there really is a difference is left for future research. However, in section 4.8 I briefly come back to the issue of preconditions.

A second aspect is to model how agents coordinate on options. Agents coordinate on a decision problem, they build the decision matrix together. One function of bcs in this context is to make aware of options and coordinate on the space of options. This issue is tackled by Franke and de Jager (2011) and Bledin and Rawlins (forthcoming) and might need to be implemented into a theory of interpreting practical bcs. However, with this issue a whole new set of problems comes in. Even just an evaluation of the prospect of such an endeavor cannot be given here.

4.7.2 Illocutionary inferences and contextual conditions of preference alignment

In the preceding section I tried to establish the link between the utterance of a bc and practical reasoning about preferences. I here assume that practical reasoning from a bc leads to the inference that the speaker proposes to adopt a specific preference by indicating an option or demarcating the space of licit options. In this section I aim to show that mechanisms of preference alignment are responsible for different kinds of illocutionary flavor of bcs. Besides from advice and suggestion uses, bcs can also figure as commands like in (240) or the you-are-four case from Siegel (2006) (241).

(240) [Child and parents driving on a road trip]
    Child: Oh, look! McDonalds. Can we stop there?
    Parent: If you are hungry, there are biscuits in your lunchbox.

(241) If they ask you how old you are, you are four.
In (240) the child prefers an option that is not compatible with the preferences of the parent. Indeed, the parent has the power to dictate the preferences of the child by their social relation. If there is a power asymmetry between speaker and addressee where the speaker controls the range of permissible options, i.e. the speaker controls the addressee’s preferences, what (240) conveys is that eating the biscuits is the optimal option to ease the hunger from the perspective of the parent and the child has to adopt this preference. In other words, the child’s preferences have to be the preferences of the parent. No option that is possibly more preferred by the child is conceded than eating the biscuits (except perhaps for eating nothing at all). Similarly, for the you-are-four-case (241).

Indeed, practical bc’s show a similar heterogeneous range of illocutionary flavors like imperatives. bc’s can be interpreted as either permission (suggestion), directive (command) or advice. Condoravdi and Lauer (2012) suggest an account of imperatives where imperatives are taken to express preferences. They track the heterogeneity of imperatives to how the preferences of discourse participants in context relate with respect to speaker’s preference and addressee inducement. These requirements are spelled out in table 4.2. The condition of the speaker’s preference spells out whether the speaker prefers the content proposition of an imperative on her own, i.e. independently of the addressee. In the case of a command interpretation of an imperative like ‘Open the window!’ the speaker prefers – independently of the preferences of the addressee – that the addressee opens the window. For an invitation or suggestion this need not be the case. For these cases, cooperation by default takes effect where the speaker for the sake of cooperation takes on a preference of the addressee and it is furthermore in the interest of the addressee that this preference gets satisfied. Addressee inducement on the other hand tracks whether it is the utterance of the im-

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76 The reduction (and simplification) to these two features that I adopt here is due to Biezma and Rawlins (2016). Table 4.2 is adopted from there.

77 Condoravdi and Lauer (2012) and Biezma and Rawlins (2016) also group wish uses of imperatives into this category. As far as I can see, bc’s do not allow for performing wishes like ‘Have a good day!’ However, I am not sure. Perhaps the following might be such a wish bc: ‘If you have to leave now, this is a good-luck kiss.’ [Speaker kisses the addressee.]
perative that induces the addressee to bring about the content proposition. With a command use, this is the case, since in command circumstances there is typically a power asymmetry and the speaker is able to determine the effective preferences of the addressee. Also in case of an invitation, this is the case, though, the speaker does not prefer the outcome independently of the addressee.

Transferred to practical bc's, it is not the content proposition of the consequent that is important for the illocutionary flavor, but the inferred proposition about a possible action, option or outcome. The bc consequent provides a precondition for this option that is inferred via pragmatic enrichment (decision theoretic accommodation). For directive uses, the indicated outcome is preferred by the speaker, and, due to a power asymmetry, the utterance induces the addressee to act accordingly. For permissions and invitations, the speaker does not prefer the outcome herself. However, by cooperation by default, it has to be compatible with her individual independent preferences. In this case, the utterance induces the addressee to ensure the outcome. E.g. in the case of the suggestion inference for ‘If you are hungry, there are biscuits on the sideboard’, the speaker doesn’t have a preference independently of the addressee for her eating the biscuits. I.e. the speaker is cooperative by default and the condition of speaker preference is not fulfilled. However, the speaker indicating that there is the option of eating biscuits induces the addressee to take action if the supposition indeed holds, i.e. if she’s hungry.

<table>
<thead>
<tr>
<th>Flavor</th>
<th>Sp preference</th>
<th>Add inducement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directives</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Concessive permissions</td>
<td>√</td>
<td>X</td>
</tr>
<tr>
<td>Permissions, invitations</td>
<td>X</td>
<td>√</td>
</tr>
<tr>
<td>Disinterested advice</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Table 4.2: Imperatives
Additionally to the relevant proposition, i.e. the option or action being inferred in practical *bc*s, there are further differences that allow to narrow down the contextual circumstances that give rise to illocutionary inferences in *bc*s. Imperatives are subject to a condition of minimal speaker involvement (242).

(242) The speaker takes it to be possible and desirable that, after his utterance, there is no action on his part that is necessary for the realization of the content. (Condoravdi and Lauer 2012: 48)

For *bc*s this requirement is not necessary, though, such a requirement might be inferred via world knowledge. Only if a similar requirement can be inferred, illocutionary inferences arise. If realizing an indicated option is on part of the addressee and not on part of the speaker himself, such an inference goes through.

For example (115) (repeated below as (243)) does not give rise to illocutionary inferences. Rather, the speaker himself indicates the action she will take with respect to the pragmatically enriched QUD ‘What to do if the zombies attack?’. Thereby the speaker conveys something about her own preferences. The link to practical reasoning still holds, but no illocutionary inference arises. The difference lies in the realizability and controllability conditions that are inferred from contextual resources.

(243) If the zombies attack I have my gun.

Furthermore, a *bc* that helps to resolve a decision problem by ruling out an option does not give rise to an illocutionary inference either, since no option for fulfilling the goal is indicated. Rather it is indicated that one way to fulfill the preferences is not viable, e.g. in (244).

(244) If you want to go to Harlem, the A-train just left.
The interpretation triggered is not necessarily that the addressee should give up the goal of going to Harlem, but that she has to find a different way for satisfying it. Hence, the illocutionary inference only holds if the information in the consequent pertains to a realizable option. More work needs to be done to get a detailed picture of the conditions under which illocutionary inferences in bcs arise. But (242) gives guiding hints on these conditions that comprise controllability, speaker involvement and realizability. Things get quite complicated at this point and the issues about the inferences become more and more case-specific.

4.8 Beyond practical bcs

In the preceding sections starting from Biezma and Goebel’s (2019) discourse account of if-constructions I mainly tried to explain within the pragmatic account of bcs how practical and illocutionary readings of bcs arise. This kind of reading was one of the foci of the literature on bcs taking its cues from Austin’s (1956) example ‘There are biscuits on the sideboard, if you want some’. This also led scholars to conceive of bcs as carrying some special illocutionary element and conceptualizing them as speech act conditionals.

The aim of the preceding sections was to show that an explanation of bcs that receive a practical reading and give rise to an illocutionary inference is feasible within a pragmatic account. Indeed, these readings can be explained with independently motivated machinery. As pointed out at the end of the last section, it is also possible to show why not all practical bcs give rise to a strong illocutionary inference.
In chapter 2 I have emphasized the diversity of different readings of \textsc{bcs}. Practical \textsc{bcs} and \textsc{bcs} with illocutionary inferences are just a subgroup of the different readings of \textsc{bcs}, though, a quite sizable one. In section 4.3 I have introduced NaR reasoning as pragmatic reasoning that is responsible for inferences with respect to if-constructions. Indeed, NaR reasoning is compatible with constructing the reasons for using a more complex form in a variety of ways.\footnote{This is also emphasized in Lauer (2014) with respect to disjunctions.}

In light of this variety this section critically assesses the achievements of the preceding sections. One example where no direct practical reading arises is (245).\footnote{The example is due to María Biezma p.c.}

\begin{equation}
\text{(245) [Speaker and addressee being on a train, not being able to do anything about the laundry getting wet.]} \nonumber
\end{equation}

\begin{enumerate}
\item A: If it rains, the laundry is outside.
\item The laundry gets wet.
\end{enumerate}

The definition of biscuithood provided in chapter 3 is satisfied in (245) since antecedent and consequent are factually independent with respect to the situation. Therefore the strengthening inference (\text{CE}) arises. However, no illocutionary inference nor a practical reading is given. Rather, it is just conveyed that in case that it is raining the laundry gets wet. The utterance cannot be understood as a request, since the utterance situation – being on the train and not being able to do anything about the laundry getting wet – precludes this reading.

Though, we cannot account for (245) with the mechanisms presented in the preceding sections, part of the reasoning that is applied in the practical cases carries over into a general scheme for the interpretation of \textsc{bcs}. Using the terminology of Condoravdi and Lauer (2016) I have claimed that in practical \textsc{bcs} the consequent provides a precondition for an option, i.e. for fulfilling some preference with respect to the suppositional context. Though I have also observed that the kind of precondition might be
slightly different in bcs in contrast to anankastic conditionals (e.g. in bcs the precondition is realized and not claimed to be realizable), the consequent in (245), that the laundry is outside, has to be understood as a precondition of the laundry getting wet. The latter proposition has to be inferred by the interpreter from world knowledge. Therefore, the general scheme of pragmatic enrichment in bcs is that the proposition in the consequent of a bc has to be interpreted as a precondition for some other proposition in the suppositional context. Whether the precondition is one for some action or for something different will be dependent on context. Note that (245) can convey that the laundry gets wet, but in a different context at the same time can be used to indicate that e.g. the family member left alone at home should take care that the laundry has to be brought into the house if it rains. Here, there are multiple inferences that pertain to the factual level, but also to what discourse participants assume about their preferences and how the latter align.

(246) **General scheme for bcs**

The information provided by the consequent has to be interpreted as a precondition for some other proposition being true within the suppositional context.

The general account of interpreting the consequent as a precondition for a proposition in the suppositional context requires a worked out account of how to conceive of a precondition. Especially work on causal structures and the notion of necessity and sufficiency in this context might be relevant here.80 An elaboration on the notion of a precondition has to be left for future work.

80 See e.g. Kasper (1992) and the adoption in Biezma et al. (2013) for the notion of a precondition. Important work on causal structures in linguistics that could be instructive for a formalization of the notion of a precondition is provided in Lauer and Nadathur (forthcoming) and Lauer and Nadathur (2019) and in the already mentioned Snider and Bjorndahl (2015). However, a major desideratum may be to include representations of actions into the causal model framework.
A question that we are faced with, especially with respect to (245), is why the speaker does not convey that the laundry gets wet directly by uttering (247).

(247) If it rains, the laundry gets wet.

A speaker might prefer to utter (245), because (247) may give rise to the question of the addressee why the laundry gets wet. This response is natural if the addressee either didn’t have any belief about the whereabouts of the laundry or might have assumed that the laundry is inside. For (247) the proposition that the laundry is outside is not common ground in this scenario. We can roughly differentiate between two functions of the consequent of (245). First, it makes the speaker aware of the subject matter of the laundry and its whereabouts. How to represent such updates is a topic in current research.\(^8\) It seems that bc\(s\) are especially suited for this purpose, but it is not clear why. (247) for example is rather degraded discourse-initially. In contrast, (245) seems to be a good way to bring up the issue about the laundry. Secondly, the use of the bc (245) allows the speaker to communicate more efficiently and economically by being able to provide more information at once, building on contextual information and general world knowledge. However, the speaker has to rely on the inferential capabilities of the interpreter. But this is nothing new. The Gricean concept of speaker meaning, i.e. that speakers convey more than just the literal meaning of a sentence in a principled way similarly relies on the inferential capabilities of interpreters and makes communication more economical. Relying on inferential mechanisms allows for settling issues (answering QUDs) in more efficient and briefer exchanges.

With this we come back to an observation that we started from, i.e. that the inferences in bc\(s\) are facilitated by mechanisms of pragmatic enrichment just like in the Gricean case (248).

(248) A: I am out of petrol.

\(^8\) See Franke and de Jager (2011), Bledin and Rawlins (forthcoming) and the references therein.
B: There is a garage round the corner. (Grice 1989: 32)

However, how pragmatic enrichment works is difficult to pin down since a huge amount of non-linguistic information and non-linguistic inference mechanisms have to be taken into account. With the decision theoretic discourse model I have provided an explanation for one kind of pragmatic enrichment. But examples like (245) have to either be integrated into this model or shown to use other kinds of mechanisms. As argued, the general scheme (246) might unify the mechanisms for BC interpretations, but it certainly is in need of further elaboration.

### 4.8.1 Descriptive decision problems

In section 4.4.2 I adopted Bledin and Rawlins’s (2019) extension of their QUD model of discourse with decision problems. This facilitated to account for the resolution of the antecedent QUD in BCs. I am convinced that the general framework where practical goals give the reasons of why agents chose to set up discourse in a particular way and guide the resolution conditions of questions and QUDs is adequate for many cases. That communication is driven by practical goals is also supported by research in the evolutionary origins of communication, e.g. in Tomasello (2010). This is not to say that all communication serves to coordinate on a particular decision problem and is always oriented towards action. Communication also serves a social function, e.g. we meet with friends just to chat and exchange information. This kind of conversation might have the goal of pure coordination, i.e. building a ‘we’, which is not formalizable in terms of a decision problem.\(^82\) Anyhow, all implementations of decision theoretic machinery rest on the assumption that the decision problem in discourse is one that discourse participants mutually adopt. I.e. discourse participants

\(^{82}\) Though, see Merin (1997, 1999) who generally conceives of communication as a bargaining game.
have to decide and in the end act to achieve the practical goal. However, this cannot be entirely adequate for the interpretation of \(bc\). Consider the following cases, where a third person ((249-a) and (249-b)) or a different time (249-c) is under consideration.

(249)  
  
  a. If Maggie wants to eat something, there is pizza in the fridge.
  
  b. [A and B are sitting in a cafe and observe a stranger through the window who confusedly is standing in front of a shop window.]
A: If he wants to get in, the entrance is around the corner.
  
  c. [A and B chat about the vacations of a friend of theirs.]
A: If she wanted to eat something, there was plenty of food.

In these cases, it is not a shared decision problem of the discourse participants that is at issue. Rather, it is the preferences and the practical goal of a person not involved in the conversation that are at issue. Hence, the formalization from Bledin and Rawlins’s (2019) as it stands does not apply to all cases. Notwithstanding, it leads the way. Indeed, illocutionary inferences only arise if the decision problem in the suppositional context is one that pertains to the discourse participants (plus the additional constraints that were listed in section 4.7.1). For the cases in (249) the (hypothetical) preferences of a person are indicated with \(want\), but they could also be inferred as argued in section 4.6. Hence, accommodating with a decision problem is not necessarily bound to adopting a mutual goal on part of the discourse participants. Still, reasoning about the preferences of an agent in the suppositional context is one way of accommodating a resolution for the suppositional QUD in interpreting a \(bc\). And this reasoning is still modeled with the tools from section 4.4.2. Reasoning about the decision problem of some agent in the suppositional context is one way of spelling out the requirements form the general scheme (246): Practical goals allow to interpret the consequent as a precondition for some other proposition in the suppositional context.
4.8.2 The many faces of pragmatic enrichment

Yet, let me note that though inferring a decision problem may be licit for many cases that figure *verba dicendi* as pointed out in section 4.6.1, the general scheme (246) does not apply to those cases.

(250) If they *ask* you how old you are, you are four.

(251) If you *want to hear* a big fat lie, Trump is secretly married to Oprah.

For example, the interpretation that should be generated for (250) is that if they ask, the addressee should say that she is four. However, the general scheme cannot be applied to (250) and (251) since the *ce* inference is blocked. The interpretation of (218) as a command to lie only arises if it is already taken to be common ground that the consequent is false. Hence, the consequent cannot figure as a precondition. The interpreter needs to reason about how the information in the consequent can then be ‘useful’ or relevant in the suppositional context. And the most obvious way to achieve this is to interpret the consequent as providing the content of a possible utterance in the hypothetical context. This is similar for (251) where this kind of reasoning is triggered by the content of the antecedent: what is at issue is a lie, or rather the content of a lie in the suppositional context. This on the one hand blocks *ce* and with it the preconditional scheme and forces to interpret the consequent as the content of a hypothetical utterance.

What does this tell us about pragmatic enrichment? First, that pragmatic enrichment in the interpretation of *if*-constructions is driven by the requirements of the discourse mapping (relevance and congruence) and NaR reasoning. Second, that there are several different ways which are possible and in particular plausible ways to pragmatically enrich in a specific context. Enrichment with practical goals/decision problems is a default way, but can be implausible in some contexts. Since pragmatic enrichment is highly dependent on world knowledge and assumptions about the common ground, it is difficult and perhaps impossible to come up with a unified and general way of characterizing it. Pragmatic enrichment is
bound to how human agents in general relate content with their cognitive abilities, in particular causal and practical reasoning. But as we have seen, assumptions about factual independence and information structure can constrain and guide the many ways of how to pragmatically enrich.

Many researchers on BCS have focussed on a very restricted set of examples and contexts and fell prey to the bias fallacy. Instead of searching for counterexamples and examples that work differently than the paradigmatic cases, mostly examples were considered that confirmed the available theories. I hope that with this critical section I have shown that still there is much work to do.

4.9 Conclusion

In this chapter I have argued for the discourse account of Biezma and Goebel (2019) where the antecedent of a BCS is mapped to a suppositional QUD and the consequent has to be interpreted as giving an answer to this suppositional QUD. As argued in chapter 2, via a pragmatic inference it is conveyed that the consequent is true unconditionally. The discourse mapping that is bound to the form of the if-construction and the contextual assumption of factual independence triggers so-called NaR reasoning. I.e. the additional computational and inferential complexity of using the if-construction has to be justified somehow. Hence, the interpreter has to construct a reason why the form of an if-construction is used. This in turn generates additional inferences in interaction with the discourse constraints on the mapping, relevance and congruence. One way of constructing such a reason in line with the discourse principles is that the consequent provides information about how to satisfy specific preferences that arise with respect to the suppositional context set up by the antecedent.

This was borne out, first, by considering the meaning of suppositional questions. Following Bledin and Rawlins (2019) suppositional questions are underdetermined and require a resolution. In a BCS the consequent gives a hint to the resolution of the suppositional question. The principle of con-
gruence requires that the consequent proposition fits into this resolution as a possible answer. Hence, in the interpretation of a \textit{bc} the resolution is build around the consequent proposition. Via building the resolution, the interpreter also constructs the reason for why the complex form of an \textit{if}-construction was used. In section 4.4.2 one way of reasoning to this end was spelled out adapting decision theoretic tools and their intersection to QUDs. 4.6 refined this theoretical account by way of a comparison to the antecedents of so-called anankastic conditionals. I also tried to make use of parallels between anankastic conditionals and \textit{bcs} to account for the illocutionary inferences that are oftentimes observed with \textit{bcs} in section 4.7. It was argued that these inferences are due to practical reasoning about preferences and goal achievement that is triggered by the utterance of a \textit{bc}. This led to laying out the differences between \textit{bcs} and anankastic conditionals. Section 4.8 took a critical look at the achievements and argued that constructing a reason via practical goals is not an entirely general feature of \textit{bcs}, though it carries quite some way. However, pragmatic enrichment is in many cases dependent on specific contextual circumstances and assumptions that are due to variegated other cognitive and conceptual capabilities of agents. However, the unified perspective on \textit{bcs} comes from the linguistic form and its mapping to discourse structure that triggers NaR reasoning. Together with world knowledge specific inferences are generated.
Chapter 5

Conclusion

I have started this dissertation with the problem of how to characterize so-called biscuit conditionals (bcs). bcs show several features that set them apart from if-constructions that are conditional (hypothetical conditionals hcs). It turned out that giving a unified characterization of bcs is quite difficult. There are roughly two features that can be distinguished: first, bc readings on almost any occasion give rise to something like consequent entailment (ce), i.e. addressees are licensed to infer that the consequent is true in the context unconditionally and that it updates the context globally. Speakers are aware of this and it is part of their communicative intentions. Second, bcs typically give rise to a host of illocutionary and practical inferences. Both features are not without exceptions, which is problematic. The widespread semantic accounts start from the illocutionary feature and posit a semantic difference between bcs and hcs. This difference is spelled out by the claim that the antecedent restricts a speech act operator and does not pertain to the truth conditional content of the consequent.

In section 2.3 building on the criticism in Biezma and Goebel (2019) I evaluated several semantic speech act accounts of bcs and I argued that they all have a central problem: Even if the problematic assumption of a semantic difference for bcs is granted, there remains the problem of how interpreters resolve the ambiguous surface form of an uttered if-construction. Across chapter 2 I have argued that in English most if-constructions can
equally either be interpreted as an hc or a bc. The problem of how interpreters decide for one interpretation or the other is not addressed by any of the semantic theories. The most obvious solution would be that interpreters build upon contextual cues and engage in pragmatic reasoning to overcome ambiguity. But with this the question looms large whether the detour through the semantics is needed at all for accounting for biscuit readings. This gave rise to the prospect of an entirely pragmatic theory of bc readings and provided the motivation for the constructive part of the dissertation.

The point of departure for a pragmatic theory is the phenomenon that most bcs seem to entail their consequent (ce). This means that with the utterance of such a bc the interpreter standardly takes away that the consequent is true regardless of the truth antecedent (consequent entailment ce). But it was also observed, that ce does not hold for all bcs. The basic idea of current pragmatic accounts of bcs – mainly building on Franke (2007, 2009), but also Merin (2007) – is that ce is derived as a pragmatic inference from a contextual assumption of independence.

Chapter 3 critically reviewed the notion of independence and the formal derivation of ce given in Franke (2009). I pointed out several problems for Franke’s (2009) notion of independence spelled out as informational independence, or, in Lewis’s (1988) terms, orthogonality. The major problem is that Franke’s (2009) account is incomplete with respect to the notion of independence. As a consequence, the account overgenerates bc readings, if the contextual assumption of independence is taken to be the characteristic and central feature that drives the interpretation of an if-construction as a bc. I advocated a novel dynamic understanding of the derivation of ce, where the contextual assumption of independence generates pragmatic pressure to maintain this assumption across updates. However, on Franke’s (2009) account it is not clear why the assumption of independence has to be maintained and why the interpreter strives to maintain coherence with respect to independence. In the slightly different context of presupposition projection this shortcoming was also pointed out by Mandelkern and Rothschild (2018). Franke’s (2009) notion of independence is defined
relative to information states. If we take the relevant information state to be the context set, on Franke’s (2009) understanding the context set prior to the update with an if-construction as a BC satisfies orthogonality. On the update with the if-construction minimal adjustments are made to maintain orthogonality for the posterior context set which results in CE. Empirically, not on every occasion where the prior context set satisfies orthogonality a BC reading results. This is due to the fact that orthogonality also encodes ignorance with respect to a dependence which is not a feature to be maintained in case of an update with an if-construction.

I suggested a novel solution to this problem by refining Franke’s (2009) pragmatic account of deriving CE with the notion of factual independence in section 3.4. Factual independence allows to model the contextual assumption in BC interpretations as a transcontextual, stable constraint. I use machinery from premise semantics (Veltman, 2005) for counterfactual conditionals to model this notion. The basic idea is to model possible worlds not just as agglomerations of facts, but as having a structure that connects these facts. Two facts are factually independent if relative to the dependence structure of the world these facts are not connected. A contextual assumption of factual independence then can be modeled as there not being any worlds in the context set where the facts and the according propositions are dependent. Dependence is excluded by world knowledge. Only if this is the case, a BC interpretation can arise and the pragmatic pressure to maintain informational independence takes effect to generate CE. The context set tracks what discourse participants take to be mutually granted about the facts, i.e. which worlds are live possibilities, and also which dependencies between these facts are taken to hold. The notion of factual independence allows for modeling why informational independence in Franke’s (2009) derivation of CE is maintained across updates and thereby solves the major problem that was pointed out by Mandelkern and Rothschild (2018) a.o.
The perspective on BCs and CE entertained in this dissertation is that the assumption of factual independence is central to BC interpretations, i.e. it is what makes if-constructions BCs. The inference to CE on the other hand can be blocked by other contextual factors, even though the assumption of factual independence is in place. Cases where no CE arises (Siegel, 2006) then still count as BCs.

An intricate issue is whether we can take the contextual assumption of factual independence to be definitional for BC readings. This amounts to the claim that an if-construction is a BC if and only if there is a (mutually shared) contextual assumption of factual independence between antecedent and consequent proposition in the context set prior to the utterance of the if-construction. But this is also the case in epistemic HC s. With respect to these I have claimed that epistemic HC s stand out because it is mutually shared that the speaker does not know whether the consequent holds. Hence, the definition of BCs has to be modified with a phrase that states that the interpreter takes it that it is not excluded that the speaker knows the (unconditional) truth of the consequent. Whether there are more conditions is a question for further research.

The criterium of a contextual assumption of factual independence offered the prospect to pin down the difference between HC and BC readings of if-constructions. I suggested that a BC reading arises if there is a contextual assumption of independence. In contrast, an HC reading arises if the assumptions about dependencies of the discourse participants are compatible with a dependence between antecedent and consequent. We can say that here the context set that represents the shared information is not opinionated about a dependence between antecedent and consequent. Importantly, an if-construction that establishes independence between antecedent and consequent also counts as an HC.

A main contribution of this dissertation is to suggest a criterium to differentiate BC and HC readings, an issue that was neglected in the literature. However, I mainly focus on understanding BCs. A comprehensive account of HC readings within this framework is a topic for further research. The work in Snider and Bjorndahl (2015) on counterfactual conditionals could
be guiding for this, but would also has to be transferred to the pragmatic framework. Snider and Bjorndahl (2015) work within the causal models paradigm which is similar to the dependence framework that I use in this dissertation. Their main point is that counterfactual hcs trigger explanatory reasoning within the causal model of the context. I guess that similar arguments can be given for indicative hcs.

This leads to a further topic for future research. With Veltman (2005) I have chosen the most general representation of dependencies. With this most general approach I did not have to commit to e.g. the hypothesis that the dependencies and independencies in question are always of a causal nature. Rather, Veltman (2005) himself allows for a wide array of dependencies and generalizations that these dependencies stem from. His representation of a dependence in terms of a material implication is however problematic: a world can have more than one base and the framework cannot cope with scenarios of overdetermination and common causes. I cushioned this shortcoming a little bit by postulation that each world has a unique base. But, in the end, this is just a stipulation.

That it is a major problem that Veltman’s (2005) account allows for multiple bases was already pointed out in Schulz (2007) in the context of the analysis of counterfactual conditionals. Her solution is to modify Veltman’s (2005) framework with insights from the theory of causal modeling originating in Pearl (2000). Indeed, this is also a solution that I favor, but rather with the approach of Starr (2014a). However, this would have complicated the formal apparatus to a vast extent. An open worry about the representation with causal models is, furthermore, whether this approach is not too narrow to represent all kinds of readings of if-constructions, specifically, hcs. A question that suggests itself in this context is whether for bc interpretations it is mostly or perhaps exclusively causal dependencies that are relevant. These issues are very specific and technical and could not be tackled in this dissertation because the main topic was to give a broad picture of how hcs are interpreted.
Carving out a definite criterium for bc readings and accounting for ce as a pragmatic inference was just one step in understanding the interpretational process of an if-construction as a bc. The main ensuing question that we were faced with was the discursive function of a bc, or, put differently, the discursive consequences of the pragmatic inference that leads to ce. For ce-cases the question is why the form of an if-construction is chosen if the same information could have been given with a plain assertion of the consequent.

For accounting for the discursive function of bc's I stepped back in the first part of chapter 4 and asked for the general connection between if-constructions and discourse. Following Biezma and Goebel (2019) I argued that if-constructions carry a specific information structure that can also be seen with more run-of-the-mill quantificational structures. The default information structure for if-constructions is one where the antecedent provides the topic and the consequent conveys information about this topic. Though reversed topicality is possible in if-constructions, for bc's the contextual assumption of factual independence blocks a reversal. Topicality was spelled out within the QUD model of discourse (Roberts, 1996, 2012b), where a topic is just a Question-under-discussion (QUD). In case of an antecedent-topical if-construction the antecedent introduces a suppositional question into the QUD structure that can be paraphrased by ’What is the case if the antecedent is true?’ On the discourse level the consequent is interpreted as a relevant answer to this suppositional question. Within the principles of the QUD model, relevance is defined as excluding alternatives in the suppositional context. With this a link was established between the form of an if-construction and the structure of discourse. The major purpose of this discourse mapping was to argue that the mapping generates further pragmatic inferences by the requirement that the consequent is a relevant answer to the suppositional question for bc's as well as for hc's.

A further complementing perspective was given by general reflections on the complexity of different forms of expressions and their competition in language production and interpretation (Biezma et al., 2013; Lauer, 2014). If a speaker uses a more complex form in logical or procedural terms,
this has to be justified somehow in her having a reason to use this form. The interpreter will naturally search for such a reason when interpreting a more complex form under the assumption that the speaker has chosen a form that conveys the intended message in an optimal way. This kind of reasoning is tightly linked to Gricean reasoning, but also offers a new insight, since this reasoning about complexity also pertains to the forms of expressions where purely Gricean reasoning is supposed to be independent of the forms of expressions.\footnote{The maxim of manner being an exception.} Reasoning about complexity directly connects with the information structure of if-constructions. On a general level, the discursive mapping gives the very reason why an if-construction is used, i.e. to convey that the consequent provides a relevant answer to the suppositional question in antecedent-topical cases. This holds for bc\hs and for hc\hs. For the latter, the interpreter has an easy way to infer via the possibility of a factual dependence how the consequent is relevant to the antecedent: the antecedent in some way makes the consequent true and the truth of the consequent thereby is confined to the suppositional context.

In bc\hs this way of establishing relevance is blocked by the contextual assumption of factual independence. Hence, the interpreter is forced to infer in a different fashion how the consequent can be relevant information that resolves the suppositional question. From section 4.4 on I model one way of pragmatic enrichment that is deployed in paradigmatic cases of bc\hs. In particular, this allows for an explanation of the illocutionary inferences for these cases.

Building on Bledin and Rawlins (2019) I first argued that the suppositional QUD introduced by the antecedent of a bc\hs is underspecified. It only introduces a supposition and requires that there is some open issue within the suppositional context that the consequent resolves. The resolution is inferred by the interpreter via the consequent itself plus world knowledge. In the paradigmatic cases it is real world needs in the form of a decision problem that supply the resolution. Formal tools from decision theory allow to model formally how the consequent is interpreted as a relevant,
resolving answer that helps to solve a decision problem. With decision
problems in the picture we were able to see how giving factually inde-
pendent information can be relevant for and in a specific suppositional
context.

With decision problems preferences of discourse participants came into
the picture. Preferences rank possible outcomes of actions. In section
4.6 I argue that preferences are often easily inferred from the content of
antecedents. Sometimes, as in the classical example (252), they are encoded
semantically by the use of volitional verbs like ‘want’ or ‘intend’. Here I took
inspiration from Condoravdi and Lauer (2016). The observations about BCs
supplied empirical backing for the mechanism of pragmatic enrichment
from (suppositional) decision problems.

(252) If you want to eat something, there are biscuits on the sideboard.

Section 4.7 set out to answer the question of how the illocutionary flavors
of BCs come about. Building on Condoravdi and Lauer (2016); Lauer and
Condoravdi (2014) and Condoravdi and Lauer (2012) my argument was
that the illocutionary force of an utterance of a BC is tightly connected to
the kind of pragmatic enrichment via decision problems that was devel-
oped in section 4.6 before. In interaction with general practical reasoning
(practical syllogism) the illocutionary force as a suggestion can be derived
in a principled way. For this, the information in the consequent has to
be interpreted as a precondition for a salient action that satisfies a set of
preferences, typically possible preferences of the addressee in the suppo-
sitional context. Furthermore, the different alignments of the individual
preferences of speaker and addressee, as well as their power relationship
have to be considered for the derivation of the force of an utterance of a BC.

With 4.6 to 4.7 I try to tackle the difficult issue of how speech-act force
is assigned to utterances. Standard accounts of speech acts in the vein of
Searle (1969) treat utterance force on a par with clause typing by suggesting
that any utterance carries some speech act mark at the logical form. With
this these standard accounts focus on speech act labelling and categorizing
without giving any insight about the mechanisms and dynamic effects of utterance force. In contrast to these approaches that are also in the background of semantic accounts of bcs, I try to highlight that utterance force is a context dependent issue where context, world knowledge and general pragmatic reasoning interact (Potts, 2015). That the standard picture cannot be right can be observed with imperatives where the force of the utterance of an imperative can be a blend of request, suggestion and order, i.e. where force is not subsumable into one of the speech act categories. Indeed, this phenomenon is equally pressing in indirect speech acts that, within a QUD account, can be seen as indirect answers. Indirect answers by their very substance do not only have one identifiable force. As I have argued in chapter 4 the process of pragmatic enrichment in if-constructions, in particular in bcs, is very similar to pragmatic enrichment in indirect answers. Though, the difference is that this process in if-constructions is restricted by NaR reasoning as a general pragmatic pressure and especially by the discourse mapping. Hence, it may vary from context to context which utterance force is assigned and whether this assignment is crucial for the interpretation in the context. With Potts (2015) it holds that “not speech-act labelling per se is important (often it is unclear which labels one would choose), but rather identifying and tracking the effects that these utterances have on the context.” To make progress on such an endeavor along the empirical phenomenon of bcs readings was one of the aims of chapter 4.

However, the first problem with this approach of accounting for additional inferences was that deriving them got very case specific and often-times could only be accounted for via case-by-case reasoning. Indeed, as such this kind of reasoning probably resists rigid formalization. The second shortcoming was that the notion of a precondition had to be left at an informal and intuitive level. More research into the role and the notion of a precondition has to be done. Thirdly, I asked how specific the apparatus of pragmatic enrichment from decision problems and practical reasoning is. Though, the notion of a precondition turned out to be a central notion also for other cases where no suppositional decision problems figure, it also is not general. Indeed, there are many different ways to pragmatically enrich.
But pragmatic enrichment is highly context and content dependent. It is a huge task for further research, especially for computational pragmatics, to carry some light into the dark forest of pragmatic enrichment which takes us outside of the confines of reasoning with purely linguistic resources.

A more specific and more tractable future task with respect to the information structure of *if*-constructions is, first, to give a formal account of the consequent-topical mapping in *if*-constructions, and, second, to show how the information structure of an *if*-construction interacts with discourse ‘higher up’. E.g. one question would be how an *if*-construction can be an answer to a polar or constituent question or QUD. A further question in this context would also be what role the decision theoretic picture plays here. All of this requires an extensive account of overall discourse. Roberts’s (1996) QUD model was put forward for a specific task, i.e. to account for information structure as a linguistic resource. It was not meant to account for all kinds of inferences that we can find in discourse. There are different directions to go. One is to ask how so-called optimality models of discourse or the rational speech act model can be fruitfully merged with the QUD account. Indeed, there is a vast amount of recent literature that goes into this direction to give a comprehensive model of overall discourse.

2 With this dissertation I have contributed to understanding how the overall message that is conveyed by an utterance of an *if*-construction is a complex interaction between linguistic knowledge, contextual reasoning, world knowledge and general pragmatic pressures. BCS and HCS turned out not to be that different at all. Both readings rely on reasoning about a complex form and the discourse mapping of a specific *if*-construction in context. The gist of a BCS is that the standard ways of satisfying constraints from form and discourse mapping are blocked by the mutual contextual assumption of factual independence. Hence, other ways for satisfying these constraints have to be consulted. In many cases, the consequent is interpreted as a precondition for the truth of some other proposition in the suppositional context. Indeed, the contextual assumption of factual

2 See also Potts (2015).
independence has two consequences. It leads most frequently to ce, i.e. one specific kind of pragmatic enrichment, but it also influences and restricts pragmatic inferences (enrichments) on other levels. Bcs therefore are an interesting subject for studying these complex interactions and layerings of the construction of meaning.
Bibliography


Merin, Arthur (1997). “If all our arguments had to be conclusive, there would be few of them”. In: *Arbeitspapiere SFB*. Vol. 30. Stuttgart: University of Stuttgart.


