

Being pragmatic about biscuits

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1 Introduction

Austin (1956) pointed out differences between what came to be known as *biscuit conditionals* (henceforth BCs) (1), and (regular) *hypothetical conditionals* (henceforth HCs), (2).¹

- (1) If you are hungry, there are biscuits on the sideboard. BC
(2) If you are hungry, I will make biscuits. HC

When comparing (1) and (2), the most prominent difference is that in BCs like (1) the truth of the consequent does not depend on the truth of the antecedent, i.e. upon the utterance of (1) we learn that there are biscuits on the sideboard regardless of whether the addressee is hungry. The speaker uttering (2), in the most prominent reading, may not make biscuits if the addressee is not hungry.

Standard analyses of indicative² HCs predict that in uttering an *if*-construction *if p, q* the consequent is only claimed to be true in the selected subset of worlds in the context set (in Stalnakerian terms) in which the antecedent is true. However, upon the utterance of a BC we learn that the consequent is true, in particular, that it is true in all the worlds in the context set. This raises the question of whether the semantics of BCs is the same as the semantics of HCs. We will call this the *global update puzzle* (GUP).

In addition to explaining GUP, a theory of BCs should also be able to explain inferences frequently arising with BCs. For example, given (1) we not only understand that there are biscuits on the sideboard, but also that the speaker is giving permission to the addressee to eat the biscuits (a *permission* inference). Another example is provided in (3):

- (3) If they ask you how old you are, you are four. (Siegel 2006)

The age of the addressee does not depend on whether or not s/he is asked, and (3) is considered a BC. The problem presented by this example is that the utterance of (3) is perfectly natural in a scenario in which the speaker is not committing to the truth of the addressee being four, but rather wants to convey a request for the addressee to lie (a *request* inference). A theory of BCs has to explain such inferences too.

There are (roughly) two lines of research in BCs: a semantic approach that derives the differences between BCs and HCs by appealing to differences at LF or in the semantic make-up, and a pragmatic approach

¹Austin's (1956) original example was similar to (1) but with a final *if*-clause: *There are biscuits on the sideboard, if you want them.*

²In this paper we do not address subjunctive biscuit conditionals (see e.g. Swanson 2013). However, we are hopeful that the model presented here could be extended to subjunctives, and we include some pointers throughout the text regarding what would need to be done to do so.

that tries to derive the differences between the two from the pragmatics alone. Semantic (/syntactic) approaches are quite elaborate and are carefully carved out to derive (most of) the hallmarks of BCs we have mentioned so far. For the most part, semantic approaches propose that the consequent in the *if*-construction introduces a speech act on its own (see DeRose and Grandy 1999; Ebert et al. 2014; Krifka 2014, see also Siegel 2006 for a different take on semantic proposals). Pragmatic approaches, on the other hand, propose that the semantics of BCs and HCs is the same and derive their differences from pragmatic factors (see Franke 2007, 2009; Francez 2015; Lauer 2015; Sano and Hara 2014, a.o.).³ While these proposals explain the GUP within a logical system, they have never fleshed out a full account of how to derive the inferences triggered by some BCs.

In this paper we build on pragmatic theories to propose a pragmatic account of BCs. There are two main goals in this paper: (I) to provide a definition of BCs (and hence, to characterize the differences with HCs) based on conversation participants' knowledge⁴ of possible dependencies between antecedent and consequent, and (II) to show that differences between BCs and HCs, particularly with respect to associated inferences, are due to discourse effects that should not be explained by the semantics. Regarding (I), we argue in §2 that an *if*-construction is understood as a BC when participants presuppose that antecedent and consequent are independent, i.e. the presupposition of independence is the definitional property of BCs. Contrary to what is found in previous literature, we aim to characterize a sufficient notion of independence, i.e. a notion of independence that allows us to predict when *if*-constructions will be interpreted as BCs. Global update will be shown to be a by-product of independence, providing thus a solution to GUP. We address (II) in §3, arguing that the particular inferences often associated with BCs are triggered discursively and should be separated from the semantics (these are not definitional for BC-semantics). We develop a dynamic Q(uestion) U(nder) D(iscussion) discourse model to show that the mapping between BCs and discourse structure can account for the variety of inferences that the literature has noted are associated with BCs, explaining a wide range of data without unnecessary BC-specific complications in the system. Independence as characterized in §2 plays an important role in accounting for inferences in §3 since it drives our intuitions regarding discourse relevance, triggering additional inferences to maintain relevance. We do not argue that a syntactic/semantic theory of BCs could not also account for these phenomena. However, we do argue that at the end of the day syntactic/semantic theories would still need the pragmatic mechanisms that in our proposal do all the work, raising questions as to why we would need the special syntactic/semantic machinery to begin with. We offer a comparison with a syntactic/semantic account in §4.

Our strategy in this paper will be to develop a minimal semantics for *if*-constructions that is uniform across HCs and BCs. This semantics, to be developed in a dynamic framework in §2, builds on the quantificational intuition described above: an *if*-construction *if p, q* makes a (quantificational) claim about selected *p*-worlds, that they are *q*-worlds. Differences between HCs and BCs will be derived along two dimensions: independence between antecedent and consequent (in §2) and mapping to discourse structure in a dynamic discourse model (in §3). One consequence of this view is that traditional ideas of 'conditionality' end up weakened. Given a uniform semantics for HCs and BCs, *if*-constructions do not directly encode the types of dependencies associated with causality, etc. Such intuitions arise only in relation to a subset of *if*-constructions and depend on the assumptions made by conversational participants regarding dependence relations between antecedent and consequent. The semantics of *if*-constructions simply involves (the dynamic implementation of) quantificational claims. Conditional interpretations arise (i) when we understand that the speaker does not want to commit/ cannot commit to the consequent being true across the board and (ii) when we infer that there is a plausible dependence between antecedent and consequent. In the absence of a plausible dependence (as in BCs), a conditional meaning does not arise. In a nutshell, our proposal

³See Rawlins (2017) for an overview of the different proposals.

⁴In this paper, the world *knowledge* is used in an intuitive, rather informal, manner. We have chosen to speak about *knowledge of possible dependencies* instead of *beliefs* because beliefs about (in)dependencies are harder to give up than other beliefs. But since our model only represents speakers' attitudes, calling it knowledge should hopefully not introduce a confound.

is that we can explain the difference in interpretation while maintaining the same conventional semantics with an appropriate characterization of independence (accounting for GUP) and a dynamic discourse theory that explains enrichment on the basis of independently motivated principles (deriving the special inferences associated with BCs).

The structure of the paper is as follows: in §2 we provide a characterization of independence that is sufficient to obtain a BC-interpretation for *if*-constructions. The section offers a discussion of previous literature (in particular Franke 2007, 2009) and develops a characterization of independence that distinguishes between *factual* and *informational* independence. The difference between the two is exploited to both define BCs and characterize their behaviour in a dynamic conversation setting. The section offers a toy dynamic discourse model to illustrate the relevance of independence in BC-interpretation and the solution to GUP. In §3 we expand the dynamic discourse model to a fully-fledged QUD-model and appeal to strategies for mapping sentences to discourse to account for the particular inferences often associated with BCs. The section offers a detailed overview of how questions and answers interact in a QUD-model and points to the discourse principles and information-structure constraints that guide conversation participants in the identification of the (often implicit) QUD. It offers a discussion of how *if*-constructions are mapped to discourse and spells out constraints on this mapping arising from independence that make BCs special. The inferences often associated with BCs are shown to follow from general discourse principles, once the relevant mapping has been established. In §4 we offer a (brief) comparison with alternative accounts, with the goal of showing that proposals that make special assumptions about the syntax or semantics of BCs end up also appealing to pragmatic principles like the ones defended here, which we have argued are sufficient on their own to account for the intuitions surrounding BCs. In §5 we offer a few concluding remarks.

2 Presupposing factual independence: A model of information update

In the pragmatic literature, ‘independence’ between the antecedent and consequent has been claimed to be a property of those *if*-constructions that are interpreted as BCs (Franke 2007, 2009; Francez 2015; Lauer 2015; Sano and Hara 2014). The notion of independence is grounded on our assumptions regarding how the world actually works. An *if*-construction like *if you are hungry, there are biscuits on the sideboard* is interpreted as a BC, and independence reflects that we assume that biscuits do not appear magically when one is hungry (one is independent of the other). However, as currently defined in the literature, independence is not a sufficient condition to identify BCs. The notion of independence in Franke (2007, 2009) is not designed to predict when *if*-constructions are interpreted as BCs, but rather to explain how we obtain consequent entailment (to explain GUP) when they are interpreted as BCs, (e.g., to explain how we learn that there are biscuits on the sideboard from the example above). In this section we build on Franke (2007, 2009) to provide a formal notion of independence that can be considered a definitional property of BCs, one that makes predictions about when an *if*-construction can be interpreted as a BC (as opposed to an HC). An important ingredient in our proposal is the idea that to achieve an adequate predictive characterization of independence for BCs, it is necessary to establish a distinction between independence in terms of how the facts in a world relate to each other and independence in terms of how agents may learn about facts in the world.

The structure of this section is as follows. In §2.1 we review Franke’s notion of independence and spell out shortcomings that arise when we try to use it as a predictive notion in the interpretation of *if*-constructions. In particular, Franke’s independence would predict, contra speakers’ intuitions, that all factual conditionals are BCs. In §2.2 we introduce a notion of independence that overcomes those shortcomings. We build on a suggestion in Franke (2007) to use counterfactual mechanisms to model independence and on Francez’s (2015) idea that in BCs an interpreter rules out dependence in the common ground. In our proposal,

that two propositions are (factually) independent is a stable and transcontextual⁵ property of information states. In §2.3 we begin spelling out how the new notion of independence allows us to make predictions about the interpretation of *if*-constructions, and in 2.4 we introduce a (toy) dynamic model illustrating the interpretational process and the solution to GUP. This model will be extended in §3.

Our final goal is to provide an understanding of how speakers' assumptions about the world, and what they envision as possible or impossible dependencies, affect whether or not they identify *if*-constructions as BCs. We can give a quick illustration of the important role played by those assumptions with the following example:

(4) If you like blue, the wedding dress is blue.

Whether or not (4) is understood as a BC or an HC depends on contextual factors. Imagine that (4) is uttered by someone who is offering to buy the wedding dress for the addressee and is discussing what color the dress will be. With (4) the speaker conveys that the dress will be in whatever color the addressee likes, for example, blue. However, in a context in which the dress has already been made without consulting the addressee about the color, and we know that its color can't be changed, (4) will be understood as a BC (the speaker is probably hoping for a happy coincidence).

2.1 Previous notions of independence

The notion of independence in Franke (2007, 2009) is designed to explain how the utterance of a BC comes to have the same informational impact as an utterance of the matrix clause (the consequent) alone. It targets consequent entailment in BCs: upon understanding that *if you are hungry, there are biscuits on the sideboard* is a BC, we learn that there are biscuits on the sideboard. In Franke's characterization, two propositions are independent iff upon learning that one is true, we do not learn anything regarding the truth of the other (this notion of independence is in fact equivalent to Lewis's (1988) notion of orthogonality of subject matters). In Franke's approach,⁶ independence is a structural property between propositions established in relation to information states characterized as sets of possible worlds. It can be viewed as a notion of *informational independence*:⁷

(5) Let W be a set of possible worlds and $\phi, \psi \subseteq W$, i.e. ϕ, ψ are propositions, X and Y variables over propositions and σ an information state, a set of possible worlds. Propositions ϕ and ψ are orthogonal iff

$$\forall X \in \{\phi, \bar{\phi}\}, \forall Y \in \{\psi, \bar{\psi}\} : \text{if } \diamond_{\sigma} X \text{ and } \diamond_{\sigma} Y, \text{ then } \diamond_{\sigma}(X \cap Y)$$

where $\diamond_{\sigma} P$ is shorthand for $P \cap \sigma \neq \emptyset$, i.e., compatibility of P and the information state σ .

Lauer (2015) walks us through the explanation of consequent entailment in BCs within Franke's system: upon the utterance of a BC with semantics $\phi > \psi$, the interpreter *Int* reasons about what the speaker's S information state σ_S is like. Her hypotheses are sets of information states (Σ_{σ_S}) whose elements are *Int*'s candidates for S 's presuppositional state.⁸ When interpreting a BC, *Int* assumes informational independence between ϕ and ψ in σ_S as defined in (5), and also learns that $\neg \diamond(\phi \cap \bar{\psi})$ (because of the semantics of the

⁵The label *transcontextual* is due to Merin 2007.

⁶ See (Franke 2009, def. 5.12). As Franke points out, this notion of independence captures the idea that two propositions are independent for an agent when learning the truth or falsity of a proposition doesn't allow the agent to decide whether the other is true or false **when the truth of such propositions was not decided before**. As we argue below, this notion of independence doesn't allow us to explain our intuitions about factual conditionals.

⁷Franke calls this notion of independence *epistemic independence*, but this label is misleading. We thank Cleo Condoravdi for this alternative denomination.

⁸ Σ_{σ_S} evolves (i.e. shrinks by eliminating epistemic states that are no longer candidates) as *Int* learns more about the speaker's information state through her utterances.

if-construction), and that $\diamond\phi$ in σ_S (accommodating if necessary the presupposition of the conditional⁹). The only information state that satisfies informational independence between ϕ and ψ and the information learned from the utterance of the *if*-construction is one in which ψ is true in all information states in σ_S (i.e., $\neg\diamond\sigma(\bar{\psi})$). In the end, consequent entailment in a BC $\phi > \psi$ is the unavoidable result of the assumption of informational independence put together with the information conveyed by the *if*-construction.

Discussion Franke’s characterization of independence was meant to derive consequent entailment given an *if*-construction identified as a BC. However, if we were to use this notion of independence in a predictive manner, to identify when *if*-constructions are interpreted as BCs, we appear to run into trouble. There are two types of concerns. The first arises because Franke’s proposal does not contemplate the fact that we learn about new dependencies in the course of a conversation. The second arises because the conditional statement of (5) makes incorrect predictions when the antecedent in an *if*-construction is known to be true. We will spell this out below and use the discussion as a stepping stone to our modified characterization of independence in §2.2.

Let’s start with the predictions that would be made for cases in which conversation participants are ignorant about possible dependencies (see also Mandelkern and Rothschild 2018 for this problem and for a version of the following example). Consider the propositions denoted by utterances of *Bill is going to the party* and *Sue is going to the party*. If these propositions are not common ground, and neither is information about dependencies amongst them, the information state of a participant will have worlds where Bill goes and Sue doesn’t, worlds where Bill goes and Sue goes, worlds where Bill doesn’t go and Sue does, and worlds where neither Bill nor Sue go. This information state satisfies informational independence/orthogonality as characterized in (5). Imagine that in this scenario, a speaker utters the *if*-construction *if Sue is going to the party, Bill is going to the party*. If we were to use (5) in a predictive fashion, we would expect such *if*-constructions to be understood as BCs. However, a plausible outcome from such an utterance would be to actually learn about a dependency between the two propositions (that Bill’s going to the party depends on Sue’s going). Franke’s proposal does not address this. That is, there is no room in the system, as is, to understand that we can give up orthogonality and learn a dependency, or maintain orthogonality and obtain a BC interpretation.

The second concern mentioned above is about the predictions made when a proposition is known to be true. The issue can be illustrated with so-called *factual conditionals*, exemplified below:¹⁰

(6) John is visiting his grandmother, who lives very far away from him:

John: Hi grandma! I’m starving!

Granny₁: But of course, my dear. It’s been a long trip! If you are (so) hungry, I will make some biscuits.

The importance of (6) is that even though we can understand that the antecedent is known to be true, Granny₁’s utterance may be taken to convey that it is John’s hunger that would prompt her to make biscuits. Contra Franke’s prediction, Granny₁’s utterance can actually be interpreted as an HC (though the BC-reading is also available).¹¹ Franke’s notion of independence in (5) is stated as a conjunction of material implications and predicts that only a BC interpretation will be available. Consider ϕ as the (known) antecedent in

⁹This presupposition is assumed for indicative conditionals, and also holds in the counterfactual case given that the *if*-construction is evaluated w.r.t. a revised state where the antecedent is true.

¹⁰The *if*-constructions in (6) are what are called in the literature *factual conditionals*: *if*-constructions in which the antecedent is taken to be true by somebody other than the speaker (and possibly also the speaker) (see a.o. Iatridou 1991; Bhatt and Pancheva 2006; Constant 2014). We take this label to be descriptive label and not to affect the semantics of *if*-constructions.

¹¹A BC-reading for a factual conditional would be even more prominent with reversed temporal order, as in Granny₂: *But of course, my dear. It’s been a long trip! If you are (so) hungry, I just made some biscuits. They are on the sideboard.*

Granny₁'s *if*-construction, and ψ as the (unknown) consequent. The propositions will be independent (in an information state σ) iff:

- (7)
- a. If $\diamond\phi$ and $\diamond\psi$, then $\diamond(\phi \cap \psi)$
 - b. If $\diamond\phi$ and $\diamond\bar{\psi}$, then $\diamond(\phi \cap \bar{\psi})$
 - c. If $\diamond\bar{\phi}$ and $\diamond\psi$, then $\diamond(\bar{\phi} \cap \psi)$
 - d. If $\diamond\bar{\phi}$ and $\diamond\bar{\psi}$, then $\diamond(\bar{\phi} \cap \bar{\psi})$

Given the truth of ϕ and ignorance regarding ψ , both (7a) and (7b) hold. But the truth of ϕ also makes the conditionals in (7c) and (7d) true. This means that if we use Franke's notion of independence as predictive for the BC-interpretation of an *if*-construction, all factual conditionals will be BCs: once we learn about one proposition being true, we lose the ability to track dependencies with other propositions. The established proposition just becomes independent from any other proposition.

The two problems outlined above stem from the fact that independence and dependence are modeled only as structural properties of an information state characterized as a set of possible worlds.¹² The proposal we offer in this paper is a system in which we can store information gain about facts separately from information about how those facts depend or not on each other. This allows us to encode the independence at play in the interpretation of BCs as a stable assumption in the respective information state and also allow for the possibility that we learn about dependencies.

2.2 Severing informational independence from factual independence

We propose to characterize a predictive notion of independence by distinguishing between *informational dependence* (roughly, that knowing one fact allows us to learn about another), which is not stable, and *factual dependence* (that facts actually depend on one another), which is part of the structure of worlds. This allows us to separate what we know regarding facts that are live options, from learning new dependencies between those facts or preventing dependencies from being learned (because we rule them out). That is, separating informational independence from factual independence allows us to establish when two propositions are taken to be informationally independent at the utterance time (because, let's say, we do not know that they in fact depend on each other) while allowing us to learn later on that they in fact depend (they are factually dependent). It also allows us, once we know that two propositions do not factually depend on each other (they are factually independent), to keep them informationally independent. The resulting picture is one in which one's information state builds on assumptions about factual independence.¹³

The proposal we put forward in this paper to characterize a predictive notion of independence is that two propositions are taken to be independent if the speakers assume that it is common ground that they *can't* be dependent. That is, independence is presupposed in a Stalnakerian sense. In order to model these notions we make use of the machinery used to model factual dependencies in the interpretation of counterfactual conditionals (a.o. Veltman 2005; Kratzer 1989; Arregui 2011). In a way, the proposal made below can be understood as showing that the same notion of dependence between facts that modulates the interpretation of counterfactual conditionals surfaces in the case of indicatives to predict whether an *if*-construction is interpreted as an HC or a BC.

2.2.1 Factual independence and independence between propositions

Dependence between facts is known to play a role in the interpretation of counterfactual conditionals. Counterfactual antecedents invoke circumstances that differ from actuality with respect to certain facts. In identifying the worlds quantified over, we need to consider what other facts are also true or false in

¹²The term 'structural property' is due to Francez (2015), who also argues, as we will, that this structural property should be derived from knowledge about causal and epistemic dependencies. This insight is, however, not implemented in Francez's (2015) formal proposal.

¹³We can learn about the dependence between two propositions only if we do not rule out their factual dependence.

consequence. That is, we need to understand “how facts stand and fall together” (Kratzer 1989). We argue that considerations about factual dependencies are also relevant in determining whether *if*-constructions are interpreted as BCs or HCs. In this section we spell out a predictive characterization of independence building on proposals for the semantics of counterfactuals in Veltman (2005) together with modifications in Arregui (2011).

In Veltman’s (2005) proposal, dependencies are *factual dependencies*, and beliefs about facts and beliefs about dependencies between facts are tracked separately. We adopt a modification from Arregui’s (2011) take on Veltman (2005) to build dependencies directly into possible worlds ontologically. We take possible worlds to be *structured* possible worlds (see Starr 2014a): a world represents what is true at that world, but also how some propositions are made true by other propositions being true via dependencies between facts. Following Arregui (2011), worlds are made of a *base*, i.e. facts that do not depend on other facts, and a set of dependencies between facts, *laws* in Veltman’s (2005) terminology, that determine facts that depend on other facts and how. In what follows we spell out the basic formal details of the model.

Adopting Veltman, we assume that possible worlds are complete valuation functions from a (finite) set of atomic sentences of a language \mathcal{L} to the truth-values $\{0, 1\}$.¹⁴ To express that an atomic sentence p is true at a world w we write $\langle p, 1 \rangle \in w$ or $w(p) = 1$ or 0 if it is false (this is the definition of positive and negative facts in Veltman 2005 and underlies our informal talk of facts being true in a world). We take situations to be subsets of worlds, $s \subseteq w$ (a partial function from \mathcal{L} to truth values). Facts are minimal situations, but situations can contain more than one fact, and worlds are maximal situations. Sentences denote propositions, sets of possible worlds: the proposition expressed by p is $\llbracket p \rrbracket$.

The truth/falsity of a fact often times depend on other facts being true or false as well.¹⁵ Facts are then connected by a web of factual dependencies. The classic illustration in the literature refers to Jones and his hat-wearing habits (Tichy 1976). When the weather is bad, Jones wears his hat (the wearing of the hat depends on the weather being bad) and, hence, if it is a fact that at w the weather is bad, the dependence relation establishes that it is also a fact in w that Jones wears his hat.

A complete world can be determined with the independent fundamental facts of the base and the set of dependencies (laws). We follow Arregui (2011) in the modification of Veltman’s system, and consider a single world as a starting point. Dependencies are taken to be dependencies of a particular world (since they can be different in different worlds). A world w is associated with a *law horizon* U_w , the set of worlds having the same laws as w . U_w determines a set of factual dependencies and allows us to have an indirect representation of the laws in effect in w . The other component necessary is the *base set*, i.e. the set of independent facts in w that, together with U_w , determines w .

- (8) a. A situation s determines a world w w.r.t. U_w iff for all $w'' \in U_w : s \subseteq w'', w'' = w$.
 b. A situation s is a *base set* for a world w iff s is a minimal situation that determines w w.r.t. U_w , i.e. there is no $s' \subset s$ such that s' determines w .

In this system, if it is a base-fact that the weather is bad and there is a dependency linking bad weather and Jones wearing a hat holding at w , it is a dependent fact in w that Jones is wearing his hat.¹⁶

This system, so far, allows us to identify independent facts (those in the base set) and dependent facts (those that depend on base set facts). However, for our purposes we also need to be able to identify for two possibly dependent facts whether they are independent of each other. That is, we need to be able to identify whether two given facts are somehow (perhaps indirectly) related in the web of dependencies of a world.

¹⁴In different settings like Kripke’s framework one would want to claim that possible worlds *determine* such functions, but are not equivalent to them.

¹⁵Strictly speaking, facts are not true or false, but positive and negative.

¹⁶As noted in Starr (2014a) what counts as a base (salient variables) might be context dependent. For purposes of simplification, we do not go into this issue.

Two facts may be ‘dependent’ yet *independent of each other* if they are dependent on different base-facts. Let’s take Jones hat-wearing fact, which depends on the bad weather (base fact) and let’s take Mary’s going out to dinner tonight, which depends on some dinner arrangements (base fact). Those two dependent facts (Jones wearing his hat, and Mary going out for dinner tonight) are independent of each other because their base facts are different. Informally, two facts m and n are independent of each other with respect to a world w and U_w iff they can be retraced to two disjoint subsets in the base sets of w .

We will pin this down more formally moving up to the level of propositions and adopting aspects of the system in Arregui (2011). We first characterize situations that (minimally) force a proposition (given a law horizon $U_{w'}$) (9). We then characterize factual independence between propositions in terms of situations that minimally force the propositions (10).

- (9) a. A situation s forces a proposition $\llbracket p \rrbracket$ within $U_{w'}$ iff for every world w in $U_{w'}$ such that $s \subseteq w$, $w \in \llbracket p \rrbracket$.
- b. A situation s minimally forces a proposition $\llbracket p \rrbracket$ within $U_{w'}$ iff s forces $\llbracket p \rrbracket$, $s \subseteq s'$, where s' is the base set of w' , and there is no $s'' \subset s$ that forces $\llbracket p \rrbracket$.
- (10) Two propositions $\llbracket p \rrbracket$ and $\llbracket q \rrbracket$ are factually independent with respect to w and U_w iff there exist s' and s'' in w s.t. s' minimally forces $\llbracket p \rrbracket$, s'' minimally forces $\llbracket q \rrbracket$, and $s' \cap s'' = \emptyset$.

The definitions above provides the expected result: two propositions are factually independent for w iff whether they are true or false at w can be traced to disjoint situations in the base set of w .

Let us take stock. Informational independence/orthogonality as discussed earlier builds on the distribution of worlds amongst an information state. This means that whether informational independence is satisfied is only determined by whether there is a world in the information state for each combination of truth values in question. However, this does not encode that a specific combination of values may spring from certain relations between the respective facts *in* these worlds, e.g. that one sentence being true at a world is ‘responsible’ for the other sentence being true there too. The proposal argued for here is that accounting for such ‘worldly’ relations amongst facts in worlds, solves the problems encountered by the Franke’s original proposal for independence when we try to use it in a predictive fashion.

2.3 Tracking (in)dependence in conversation

Our goal is to explain how our assumptions about independence play a role in the dynamic interpretation of *if*-constructions. How does conversational update interact with our assumptions about our world (w) and its laws (U_w)? What is the difference between the cases in which the utterance of an *if*-construction leads us to learn a dependency vs. the cases in which we interpret it as a BC? Our proposal augments a Stalnaker-style view of context update by using an *Information Store* (IS)¹⁷ to track different types of information. IS includes both assumptions shared by conversation participants about facts in the world, and shared assumptions about its laws.

We define an Information State (IS) as a tuple $\langle cs_F, L \rangle$, where cs_F is a Stalnaker-style context set consisting of the worlds at the intersection of the propositions mutually accepted in discourse; while L is the *law sphere* made up of the set of possible worlds compatible with mutually assumed laws, modelling shared assumptions about laws. The dependencies encoded in L are not hard laws, e.g. not only the laws of nature. Assumptions of dependencies in this framework stem from generalizations such as that whenever it’s cold I sneeze or that when the weather is bad Jones wears his hat, but also that things do not materialize because someone thinks of them (the reader is referred to Veltman 2005; Arregui 2011 for a more detailed discussion). Naturally, $cs_F \subseteq L$ and, crucially, (informational) dependencies depicted in cs_F cannot go against (factual) independence assumptions in L (i.e. if p informationally depends on q in cs_F , p cannot be as-

¹⁷The term goes back to Isaacs and Rawlins 2008.

sumed to be factually independent from q in L). However, since the agents' knowledge of the dependencies in a given situation is incomplete, more dependencies hold in the worlds in L than the ones known and shared by the interlocutors. For example, if interlocutors take p and q to be dependent, all worlds in L will be worlds in which p and q are dependent. Participants may not know, however, about the dependence between r and s and hence L will include at least one world where p and q depend and r and s depend as well as one world where p and q depend but r and s do not.

IS effectively encodes what participants presuppose about the facts and about the laws at a particular point in discourse (cs_F and L can be taken to track participants assumptions about w and U_w respectively). Both cs_F and L evolve: cs_F shrinks with information gain, and so does L , storing new dependencies by eliminating the worlds that do not include those dependencies (since, following Arregui 2011, we have encoded dependencies between facts in the structure of worlds themselves). What do cs_F and L look like? Assume that $\langle p, 1 \rangle$ is a mutually shared fact, while the value of q is not established. The worlds in cs_F are then all worlds in which $\langle p, 1 \rangle$ but there are worlds in which $\langle q, 1 \rangle$ and worlds in which $\langle q, 0 \rangle$. The same applies for dependencies. Imagine that it is shared that q depends on p (we write $p \rightarrow q$). The dependency will be part of all the worlds in L . However, if whether r depends on s or viceversa, or whether they are not related at all is undetermined, we will have worlds in L in which r depend on s , worlds in which s depends on r and worlds in which they are factually independent. Given that $cs_F \subseteq L$, what can be accepted factually depends on L .

With these tools in hand we can now model what it means for participants in a conversation to *presuppose* factual independence:

- (11) Two propositions (or the corresponding facts) are *presupposed* to be factually independent with respect to L iff they are factually independent (as defined in (10)) in every world in L .

With the presupposition of factual independence, L also has the structural feature of satisfying informational independence/orthogonality as characterized in (5). If two propositions are factually independent in L , they are also informationally independent w.r.t. L (i.e. whether they are true or false at w in L can be traced to disjoint situations in the base set of w). This means that if we presuppose factual independence between p and q , L includes $p \wedge q$ -worlds, $p \wedge \neg q$ -worlds, $\neg p \wedge q$ -worlds and $\neg p \wedge \neg q$ -worlds. The difference with Franke's proposal is that now informational independence is stable with respect to L : our assumptions about independence are tracked by L (we say informational independence is induced by L) and those assumptions are not affected by learning about the truth of any proposition ($cs_F \subseteq L$). Conversely, learning a dependence amounts to getting rid of worlds in which the dependence doesn't hold. This latter update is only possible if there is no assumption of independence. If independence is presupposed, the system prevents us from learning dependencies that are ruled out: if all worlds in L are worlds with respect to which two propositions are independent, this will also be the case in all worlds in cs_F ($cs_F \subseteq L$).

Having separate representations for assumptions regarding factual dependencies (L) and facts (cs_F) allows us to differentiate between cases when informational independence/orthogonality is transcontextually stable over updates and cases when it is not. It is transcontextually stable when the propositions in question are presupposed to be factually independent, captured by L . Let us consider the example of the blue dress again:

- (12) If you like blue, the wedding dress is blue.

In a context in which it is presupposed that you liking blue and the color of the wedding dress are independent (as encoded in L), (12) will be interpreted as a BC. Since $cs_F \subseteq L$, it will be impossible for (12) to result in an update that violates informational independence/orthogonality. If, on the other hand, we are in a context in which it is not known whether or not the facts are dependent, an utterance of (12) could lead to an update of L (and cs_F) that eliminates worlds in which the facts are independent, leading us to learn a

new dependency. What is presupposed about the facts (cs_F) before the utterance of (12) is the same in both cases (they are informationally independent). It is our assumptions about dependencies as encoded in L that will decide whether an HC interpretation is possible, leading us to learn a new dependency, or whether to assign a BC-interpretation, with informational independence remaining transcontextually stable. The extra layer of structure provided by the distinction between cs_F and L within IS allows us to make sense of this difference.¹⁸

2.4 Interpreting *if*-constructions as BCs.

This section introduces a (toy) dynamic model illustrating the interpretative process. The goal is twofold: to show how the ideas presented above can be integrated into a more general account of dynamic context update to derive the consequent entailment characteristic of BCs, and to lay some formal foundations that will be relevant in later sections (§3).

The dynamic model builds on the model in Biezma and Rawlins (2017), which assumes that utterances are proposals to update the context (inspired by Stalnaker 1978, see also Farkas and Bruce 2010 on assertions, Starr 2016 on imperatives and Biezma and Rawlins 2017 on questions). Update operations are defined in relation to a characterization of context that tracks not only presuppositions about facts (cs_F) and dependencies (L), but also the *assumptions* made in the context and the *proposals to update the context*. All of these evolve throughout a conversation. The model can be considered a refinement of classic views that provides a much more fine-grained picture of the intermediate steps leading to informational growth. We will start by presenting the relevant characterization of context and the operations that affect it, and then spell out the dynamic update triggered by *if*-constructions (following Rawlins 2010a, who builds on Heim 1983). With these tools in hand we will be able to examine closely the consequences of the presupposition of independence and examine the predictions our characterization of presupposed independence makes for consequent entailment.

A context is a tuple $\langle a, cs_F, L, \mathcal{F} \rangle$. cs_F and L are characterized as before. Following Rawlins (2010a), a is a parameter that tracks suppositional restrictions on cs_F by filtering representations of what is mutually assumed. It comes into play for the update operations involved in making an assumption (to be discussed later). a , cs_F and L together constitute a *local context* (l_c):

- (13) A local context l_c is a tuple $\langle a, cs_F, L \rangle$ such that: (preliminary, see §3)
- a. $a \in \mathcal{P}(W)$, where W is the set of (fine grained) possible worlds
 - b. cs_F the Stalnakerian context set ($cs_F \subseteq W$)
 - c. L is the set of worlds in which all presupposed laws/factual dependencies hold ($cs_F \subseteq L$)

The effect of an utterance is characterized in two steps: an utterance is a proposal to update the context, and to accept the utterance is to actually carry out the proposed update. This is captured by including in the characterization of context the slot \mathcal{F} to track context change proposals in terms of a *projected context*, as well as maintenance operations that turn the projected context into the current context. Before a proposal to change the context is actually made, the \mathcal{F} -slot for the projected context is the empty set (no proposal is ‘pending’, $\mathcal{F} = \emptyset$). After a proposal to change the context has been made, the \mathcal{F} -slot corresponds to what the context would look like if the proposed change were accepted (the *projected* local context).

- (14) A context c is a tuple $\langle a, cs_F, L, \mathcal{F}_c \rangle$ s.t. (preliminary, see §3)

¹⁸BCs are *if*-constructions in which antecedent and consequent are presupposed to be independent. A reviewer points out that sometimes knowledge that the consequent is true makes the antecedent likelier. That is, upon the utterance of *If you feel like it, this is the best tapas restaurant in the country* we may feel more inclined to go to the tapas restaurant. Notice however that arriving at the knowledge of that particular restaurant being the best tapas restaurant in the country requires first interpreting the *if*-construction as a BC. It is the information that we gained by interpreting the consequent as true (the BC-reading) what may make us feel more like it (but not the consequent by itself).

- a. $l_c = \langle a, cs_F, L \rangle$
- b. \mathcal{F}_c is either a local context or \emptyset . Call \mathcal{F}_c the projected context.

If the utterance is accepted (the default case), the *Accept* maintenance operation shifts the projected context to the current context, emptying the projected context slot:

$$(15) \quad c + \ulcorner \text{Accept}_x \urcorner = \langle a_{\mathcal{F}_c}, cs_{F_{\mathcal{F}_c}}, L_{\mathcal{F}_c}, \emptyset \rangle \quad \text{where } x \text{ is the participant accepting the proposal.}$$

Updates to a context are first reflected on \mathcal{F} and hence are updates on the local context. In order to represent the update made by *if*-constructions we will need to distinguish between the effects obtained by the antecedents (as assumptions) and consequents (as assertions). We'll begin with the definition of *declarative update* (\oplus), at the heart of assertion:

$$(16) \quad l \oplus \ulcorner \psi_{\langle s,t \rangle} \urcorner = \langle a_l, cs_{F_l} \cap \llbracket \psi \rrbracket, L_l \rangle \quad [\text{Declarative update}]$$

Felicitous only if $\llbracket \psi \rrbracket$ is compatible with cs_{F_l}

A declarative update of a local context l with $\ulcorner \psi_{\langle s,t \rangle} \urcorner$ will result in the intersection of cs_{F_l} with $\llbracket \psi \rrbracket$ (i.e. an update to assumptions about facts). Declarative update underpins assertion as defined below, possible only if the projected context slot is empty (i.e. no pending projected updates to resolve):

$$(17) \quad c + \ulcorner \text{ASSERT}(\psi) \urcorner = \langle a_c, cs_{F_c}, L_c, l_c \oplus \llbracket \psi \rrbracket \rangle$$

Constraints: $\mathcal{F}_c = \emptyset$

The result of updating with the declarative is to have the update of the local context as the projected context, pending evaluation. Acceptance (15) shifts the projected context to the current context (and empties the \mathcal{F} -slot).

The interpretation of an *if*-construction will also require that we characterize *assumptions*. The definition of the *assumption update* (\otimes) is provided below:

$$(18) \quad l \otimes \ulcorner \phi_{\langle s,t \rangle} \urcorner = \langle a_l \cap \llbracket \phi \rrbracket, cs_{F_l}^*, L_l \rangle \quad [\text{Assumption update}]$$

$$cs_{F_l}^* = (cs_{F_l} \cap a_l \cap \llbracket \phi \rrbracket) \cup (cs_{F_l} \cap a_l \cap \llbracket \phi \rrbracket) = cs_{F_l}^{\text{passive}} \cup cs_{F_l}^{\text{active}}, \text{ posterior updates only operate on } cs_{F_l}^{\text{active}}$$

The assumption update will update the a slot with the assumed proposition. It will also signal that only part of cs_F is active for posterior updates;¹⁹ that is, when proceeding with a declarative update (as in the simple case), this will only affect the active part of cs . In this way the system tracks that future declarative updates will affect only the subset of cs in which the assumed proposition is true:²⁰

$$(19) \quad c + \ulcorner \text{ASSUME}(\phi) \urcorner = \langle a_c, cs_{F_c}, L_c, l_c \otimes \llbracket \phi \rrbracket \rangle$$

The result of ASSUME is to have the assumption update of the local context as the projected context (pending evaluation).

¹⁹This is a rendition of Kaufmann's (2000) domain-limited update.

²⁰We focus here on indicative conditionals, in which only a is updated. For subjunctive conditionals the system needs additional complications. In the counterfactual case things get more complicated. See Veltman (2005) for a revision mechanism that can be implemented also in the current system in which subjunctives take the interpreter to a revised state. Crucially, this revised state is a subset of L . Hence, if the propositions in question are assumed to be independent in L , they are factually independent for all worlds in L . Consequently, the assumption of factual independence also holds for every subset of L . The prediction is that there are biscuit subjunctives (see Swanson 2013) and that inferences work very similar to what we observe in indicatives, but with respect to the revised state and its properties. We are leaving the spell out of the implementation for the future since its complications are not relevant for the task at hand in this paper.

To eliminate the temporary context generated by the assume update, a special update (\ominus) is defined that returns to the global context (eliminating the distinction between active and passive cs_F):

$$(20) \quad l \ominus = \langle W, cs_{F_l}, L_l \rangle$$

This update is used to define a maintenance operation AsPop that lifts up all assumptions in a once the update in the temporary context has taken place. This is similar to the usual *pop* operation on stacks (see Kaufmann 2000; Isaacs and Rawlins 2008; Rawlins 2010a; we will return to this operation in §3)

$$(21) \quad c + \lceil \text{AsPop} \rceil = \langle a_c, cs_{F_c}, L_c, \mathcal{F}_c \ominus \rangle$$

The result of AsPop is to reset the projected context to a context in which assumptions have been eliminated and the partition of cs_F into active and passive is erased. This will be relevant as the last step in the evaluation of *if*-constructions.

With a picture of the dynamics of context update in hand, we can now turn to the details of the dynamic update triggered by *if*-constructions. We follow Rawlins (2010a), who builds on the proposal in Heim (1983). The update with an *if*-construction is analyzed as involving three steps, appealing to ASSUME, ASSERT, and AsPop. First, a temporary context is created by identifying the worlds in which the antecedent is true (invoking the assumption update). Then, this temporary context is updated with the matrix clause (invoking the declarative update). The worlds lost in the temporary context are also lost in the global context. The AsPop maintenance operation clears the assumptions slot and the division of the context set:

$$(22) \quad c + \lceil \text{ASSERT}(\text{if } \phi, \psi) \rceil = c + \lceil \text{ASSUME } \phi \rceil + \lceil \text{ASSERT } \psi \rceil + \lceil \text{AsPop} \rceil$$

If participants are agnostic about the truth or falsity of the propositions in the *if*-construction, cs_F contains all possible combinations with respect to the truth values of antecedent and consequent (a very common scenario). The update in (22) effectively returns a context set in which we do not find worlds anymore where antecedent and the negation of the consequent is the case.

Let us consider now how consequent entailment in BCs can be derived to solve GUP. Imagine that the consequent and antecedent of an *if*-construction are presupposed to be factually independent (the scenario giving rise to BC-interpretations). In this case, L has the same structure as cs_F : we find worlds in L representing all possible truth-value combination for antecedent and consequent propositions (and this is stable). The regular update of *if*-constructions, i.e. just applying (22), returns a non-orthogonal picture in cs_F , which is incompatible with the independence assumption in L : if we eliminate from cs_F only $\llbracket \phi \rrbracket \wedge \llbracket \bar{\psi} \rrbracket$ worlds, learning that $\llbracket \phi \rrbracket$ is true will lead to $\llbracket \psi \rrbracket$ being also true. That is $\llbracket \phi \rrbracket$ and $\llbracket \psi \rrbracket$ are not informationally independent, which is incoherent with the assumptions in L .

The question now becomes how to accept the *if*-construction while avoiding an incoherent result, i.e. respecting the independence assumption represented in L . In principle, there are two possibilities: (i) we could conclude that the independence assumption represented in L is wrong (concluding that the speaker didn't share it), or (ii) we could proceed with minimal modifications in the update that preserve orthogonality in cs_F (i.e. we can further eliminate all $\llbracket \bar{\psi} \rrbracket$ worlds, not just the $\llbracket \phi \rrbracket \wedge \llbracket \bar{\psi} \rrbracket$ worlds). Opting for amending L involves a revision that is not lightly accepted (speakers are not prepared to give up on what they consider to be general laws, see Veltman 2005, pg. 166). The only option left is then (ii), to eliminate all $\llbracket \bar{\psi} \rrbracket$ worlds in cs_F . Arguably, eliminating all $\llbracket \phi \rrbracket$ worlds would also preserve orthogonality, but it would go against assumptions of existence of $\llbracket \phi \rrbracket$ worlds in indicative BCs.

Importantly, the update triggered by the *if*-construction identified as a BC (due to factual independence) is what leads to eliminating all $\llbracket \bar{\psi} \rrbracket$ worlds in an attempt to preserve a coherent picture, and this drive for coherence is what gives rise to consequent entailment. The dynamic update with the *if*-construction is the same as the update made by the utterance of the matrix clause alone: we learn that $\llbracket \psi \rrbracket$ is true in cs_F . In this way, consequent entailment is not a property of BCs but a consequence of the assumption of factual

independence plus a certain contextual setting, i.e. that the propositions in question are not settled with respect to cs_F .

In factual conditionals, we do not see the coherence maintaining inference since it is not necessary in this constellation. Remember that factual *if*-constructions are *if*-constructions in which the antecedent is already taken to be true. We saw above how Franke's proposal of independence predicted, contra speakers' intuitions, that all factual *if*-constructions were BCs. With factual *if*-constructions, at the time *if*-construction update takes place, we have learned that all worlds in cs_F are also $\llbracket \phi \rrbracket$ worlds. However, L is going to keep an orthogonal structure with respect to $\llbracket \phi \rrbracket$ and $\llbracket \psi \rrbracket$ if they are assumed to be factually independent, giving us a BC-reading of the *if*-construction, or it is not going to be orthogonal with respect to those propositions otherwise. It is the difference in L (which preserves our assumptions regarding dependencies independently of the information gained and stored in cs_F) what is responsible of differences in speakers' intuitions between HC- and BC-readings of factual conditionals.

2.5 Interim summary

In this section we have (i) argued that what makes an *if*-construction a BC are our presuppositions regarding factual independence, and (ii) we have provided a model of information update that, together with participants' presuppositions of factual independence, explains the global update observed in BCs. This is the first property of BCs that we wished to account for. Our proposal predicts that all BCs trigger a global update (but notice that it does not predict that all *if*-constructions triggering a global update are BCs²¹).

It is important to emphasize that in our proposal, the only factor guiding the interpretation of *if*-constructions towards either a BC- HC-interpretations are the assumptions regarding factual independence. There may, of course, be linguistic devices that highlight what those assumptions may be (see also Merin 2007, pg 21).²² For example, most biscuit conditionals mentioned in the literature contain stative predicates in the consequent (e.g. *if you are hungry, there are biscuits on the sideboard*). Stative predicates favor a biscuit reading merely because it is easier to interpret that the time of the event of the consequent overlaps with the time of the event in the antecedent and hence that there is no dependence between the antecedent and the consequent. Dependence-readings are easier to obtain when we interpret that the eventuality corresponding to the matrix clause follows the eventuality corresponding to the antecedent. Salient dependencies are often structured in this way.²³ But even with stative predicates, the ultimate interpretation relies on our actual presuppositions regarding independence (see (4) above).

In the reminder of the paper we set ourselves the task of explaining how to derive inferences often found in BCs. Our claim is that such inferences are not conventionally encoded in the semantics of BCs, they are discourse effects that should be kept separate from the semantics (and syntax) of BCs. We argue that the inferences are triggered by the mapping of *if*-constructions into discourse. The prediction is that if the same mapping were achieved via a different route, we should see the same inferences. We show that this

²¹This is a good property of our proposal: it allows us to explain why there are *if*-constructions that we (intuitively) interpret as HCs but still trigger a global update (although, arguably, through a different route).

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

The regular update of *if*-constructions together with our assumptions that the best book of the year has to be the best book of the month it appears in is what derives the global update in this case. It is a different process than the one we saw in BCs.

²²Merin (2007, pg. 21): "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 [(1)] accessible to every linguistically competent listener. If any of these lexical or grammatical features are modified, the scope for consequential readings will usually increase."

²³Lewis (1979) already pointed out that it is usually the case that events causally depend on earlier events.

prediction is indeed borne out.

3 A discourse driven account of BCs

This section spells out a proposal for the mapping of BCs to discourse on the basis of the dynamic update triggered by *if*-constructions introduced in §2, and the interaction with formalized discourse model (e.g. Roberts 1996; Büring 2003; Beaver and Clark 2008). We will show that many of the inferences associated with the utterance of BCs can be accounted for on the basis of this mapping and the assumption of factual independence. Taken together with our previous results about how independence derives the global update, the upshot is an account of BCs that does not complicate the semantics of *if*-constructions. At the heart of the proposal is the view that the particular way in which a BC is embedded into a discourse structure can be responsible for generating many of the ‘enriched’ meanings that have proved puzzling in the literature: these are the result of discourse-subordination resulting from the mapping of the *if*-construction into discourse. The proposal shifts the burden of accounting for special BC-inferences to discourse dynamics in a model in which *if*-constructions are mapped to question-answer pairs. The analysis provided in this section will thus include a fine-grained account of the discourse dynamics of a QUD model. When the facts about independence between antecedent and consequent are put together with a proposal to map *if*-constructions to question-answer pairs, the result is pragmatic enrichment driven by the imperative of discourse well-formedness.

Our views regarding the mapping of BCs into discourse can be seen as a continuation of a tradition that has established a link between *if*-clauses and questions (see for example Larson 1985; Kayne 1991; Cheng and Huang 1996; Lasnik 1996; Romero 2000 for links between conditionals and questions at the structural and at the interpretational level), which has seen recent developments in e.g. von Stechow (2001, 2009) on the topic of conditional perfection, Biezma (2011b,a) on optativity, Arregui and Biezma (2016) on backtracking, and Ippolito (2016) on the identification of premises relevant in the interpretation of counterfactuals. By characterizing the utterance of an *if*-construction as a complex discourse move involving a question and its answer, our proposal appeals to constraints on discourse structure to derive the different ‘flavors’ of BCs discussed in §3.1.2 without a BC-specific semantics: these flavors are the result of pragmatic reasoning.

In §3.1 we spell out the proposal for BCs in discourse and in §3.2 we show how our proposal can easily explain specially difficult data involving discourse-hedging BCs, and BCs whose function is not to establish relevance (we keep the discussion of BCs with a declarative matrix clause and an overall command interpretation for §4, where we emphasize the problem of syntactic/semantic accounts to explain them). In §3.3 we offer an interim conclusion, before turning to alternative accounts in §4.

3.1 BCs in discourse

The structure of this section is as follows. We begin in §3.1.1 by making explicit our assumptions regarding discourse models, following in the footsteps of Roberts (1996) and related models (see e.g. Büring 2003; Beaver and Clark 2008), incorporating our assumptions to the dynamic update model introduced in §2. In §3.1.2 we spell out our proposal for the mapping of *if*-constructions to discourse and in §3.1.3 we show that for BCs only one mapping is possible.

3.1.1 A full discourse model for BCs

Our views on discourse structure are guided by Roberts (1996) (see also Büring 2003; Beaver and Clark 2008). Roberts (1996) follows much work in the literature in philosophy by taking discourse to be a communal inquiry in which speakers agree to investigate the ways things might be (alternatives) in order to understand the way things are. In the idealized model proposed by Roberts, discourse is characterized as a partially ordered set of moves. Utterances are understood either as establishing a new question under

discussion (QUD) (*setup* moves), or as providing a (complete or partial) answer to the (possibly implicit) question participants agreed upon (*payoff* moves). Both overt and implicit QUDs are treated semantically as questions in a Hamblin-framework, and so denote the set of possible answers to the question. Roberts calls this set the q -alternative set of the question ($q\text{-alt}(q)$).

The QUD model posits an interaction between sentence-level meaning and discourse: the sentential level allows us to understand speakers' intentions by identifying the question under discussion that is being asked. In the words of Roberts (1996): “[a]ll that is given at the sentential level, conventionally, are certain sorts of presuppositions about the place and function of the utterance in the [intentional structure] of the discourse in which it occurs.”²⁴ There are linguistic cues in sentences that serve to indicate what is the QUD being addressed, and thus the intentional structures in which the utterance may be embedded. We will argue that this is of great importance in a pragmatic account of the interpretations of BCs (and for the interpretation of *if*-constructions in general). By providing a theory of how to recover speaker intentionality from sentence-level cues, the QUD model will allow us to spell out an account of the numerous shades of meaning available to BCs as inferences derived on the basis of assumptions regarding the QUD.

There are different constraints dictating the wellformedness or felicity of discourse. Below we will focus on two of particular importance to the discussion of BCs: *relevance* and *congruence*. We add these principles below as we adapt them to the model introduced in §2. We begin by adding Q , the QUD stack, as an element in the definition of context §2. The Q -slot is part of the characterization of the local context (all other definitions are as before):

(23) A context c is a tuple $\langle a, cs_F, L, Q, \mathcal{F} \rangle$ where its elements are characterized as:

- a. $l_c = \langle a, cs_F, L, Q \rangle$ is a local context.
- b. \mathcal{F}_c is either a local context or \emptyset . Call \mathcal{F}_c the *projected context*.
- c. Q is a stack of sets of propositions (the QUD stack)

Intuitively, the QUD stack is an ordered set of questions (with new questions being added to the top of the stack). The current/immediate QUD in the local context l_c (the question participants are committed to addressing) is the question at the top of the stack, i.e. given the stack of questions in a context c , Q_c , the current QUD is $top(Q_c)$. While declaratives are proposals to update to cs_F , interrogatives are proposals to update Q . Such stacks are familiar from earlier literature and we assume the standard *push*, *pop* and *top* operations on stacks (see Kaufmann 2000; Isaacs and Rawlins 2008), notating the empty stack as $Q = \langle \rangle$.²⁵

We define an interrogative update (\odot) that will be used to capture the effect of interrogatives on the context:

(24) $l \odot \ulcorner \varphi_{\{s,t\}} \urcorner = \langle a, cs_{F_l}, L, \text{push}(Q_l, \llbracket \varphi \rrbracket) \rangle$ [Interrogative update]

Felicity constraints:

- a. cs_{F_l} is compatible with $\{w \mid \exists p \in (\llbracket \varphi \rrbracket) : p(w)\}$. (answerability)
- b. $\llbracket \varphi \rrbracket$ is relevant to $top(Q_l)$ or $Q_l = \langle \rangle$

The result of the interrogative update is to push the question to the top of the local QUD stack. If accepted, this will be the question that conversation participants are committed to answering. An interrogative update will only be felicitous if the context set is compatible with at least one of the propositions that are members of the question (an ‘answerability’ presupposition), and if the question move is relevant to the question at the top of the local QUD stack. Relevance is invoked in defining both licensing conditions

²⁴Roberts (1996) uses the term *information structure* instead of *intentional structure*. However, given that the term is generally used to refer to the information category of a given constituent within a sentence, Roberts (2012) offers to use the term *intentional structure* instead.

²⁵Given a stack s , $push(s,x)$ delivers the stack resulting from adding x to the top of s . Conversely, $pop(s)$ delivers a stack in which the top element of s has been removed. Finally, $top(s)$ just establishes what’s the top element on the stack.

for the utterance of interrogatives and for assertions (the definitions below are adapted from the notion of Relevance in Roberts 1996²⁶):

- (25) **Question licensing:** a question is relevant in Q_c only if $Q_c = \langle \rangle$, or it is (part of) a strategy to answer $top(Q_c)$ (where a strategy is a sequence of subquestions that together answer a given question, Roberts 1996).
- (26) **Answerhood licensing:** an assertion is relevant to $top(Q_c)$ only if it entails, either positively or negatively, the resolution of at least one alternative in $top(Q_c)$.

Relevance is an organizational principle of discourse that guarantees coherence: participants are assumed to be relevant when making a move. Even though responses are not always answers (since participants can opt out), when speakers do not in fact opt out, we interpret their responses as answers even if they are so only indirectly (and we actually arrive at an answer via pragmatic enrichment in an attempt to make the response relevant).

We can now characterize the effects of questions on a context appealing to the interrogative update (\otimes) as follows:

- (27) $c + \ulcorner \text{Question}(\varphi) \urcorner = \langle a_c, cs_{F_c}, L_c, Q_c, l_c \otimes \ulcorner \varphi \urcorner \rangle$ **Question**
 Constraints:
 a. $\mathcal{F}_c = \emptyset$ b. $l_c \otimes \ulcorner \varphi \urcorner$ is felicitous

The effect of (27) is to change the projected context to the one that results from the interrogative update of the local context with the question. The operation is felicitous only if nothing was ‘pending’ earlier in the local projected context (i.e. $\mathcal{F}_c = \emptyset$) and if the interrogative update of the local context is felicitous.

QUDs can be eliminated from the QUD stack, e.g. when they are resolved. A maintenance operation (Pop) does this by popping the QUD from the stack:

- (28) $c + \ulcorner \text{Pop} \urcorner = \langle a_c, cs_{F_c}, L_c, \text{pop}(Q_c), \mathcal{F}_c \rangle$ **QUD resolution**
 Constraints:
 a. $\mathcal{F}_c = \emptyset$ b. $Q_c \neq \langle \rangle$

The effect of Pop is a new QUD stack in which the QUD previously at the top has been eliminated. There are two constraints on this operation: there should be no previous updates pending evaluation (i.e. the projected context slot \mathcal{F}_c should be empty), and the QUD stack itself should not be empty.

The explanatory power of this model comes from the predictions it makes about well-formed discourse structures, which crucially depend on the QUD being addressed. Different kinds of constraints guide participants in identifying the QUD, and thus the intentions of the speaker. We have already seen one of them, invoked in the licensing conditions for utterances: Relevance. Two other constraints will be important in the discussion of BCs: the characterization of Question-Answer Congruence and the characterization of (Not)-At-Issuehood.

The Question-Answer Congruence constraint is an information-structure constraint that modulates the relation between focus-marking (F-marking) in an utterance and the questions that the utterance answers:

- (29) (Question-Answer) Congruence: An utterance U with F-marking answers a question containing ≥ 2 alternatives from the set $\llbracket U \rrbracket^f$.

Appealing to the Roothian tradition (Rooth 1985, 1992, 1996) of associating both an ordinary semantic value ($\llbracket \cdot \rrbracket^o$) and a focus semantic value ($\llbracket \cdot \rrbracket^f$) with an utterance, Congruence can account for the contrast

²⁶See Büring (2003) for a more relaxed notion of answerhood. The differences do not matter for our purposes.

below (with an explicit QUD):

- (30) A: Who plays soccer?
 B₁: [JOHN]_F plays soccer.
 B₂: #John plays [SOCCER]_F

The focus value of B₁'s utterance is the set of propositions {that John plays soccer, that Susan plays soccer, ...}, while the focus value of B₂'s utterance is the set {that John plays soccer, that John plays basketball...}. Even though the proposition that John plays soccer is relevant to the question of who plays soccer, B₂'s move in (30) is not felicitous as 'Congruence' is not satisfied. It would be felicitous as an answer to a question of the form *what does John play?*²⁷ Given Congruence, F-marking on an utterance is linked to alternatives corresponding a previous question, and is thus anaphoric to previous discourse (see Constant 2014, pg. 89 following Rooth 1985, 1992, 1996, see also Roberts 1996). This anaphora guides conversation participants in the identification of the QUD.

The characterization of a proposition as being *at issue* (the *main point* of the utterance, according to Potts 2005) depends on the speaker's intentions regarding the QUD (*what is not-at-issue* is identified by opposition with what is at-issue). This can be spelled-out in a formalized discourse-model such as Roberts (1996), and will be crucial in mapping *if*-constructions to discourse-structure and deriving pragmatic effects in BCs. In Roberts's (1996) model, the QUD addressed by an utterance is identified with the not-at issue meaning of the utterance. More concretely, Simons et al. (2011) propose the following definition of at-issueness that makes reference to QUDs:

- (31) Definition of at-issueness (Simons et al. 2011, pg. 323, ex. (26))
- a. A proposition p is *at-issue* iff the speaker intends to address the QUD via $?p$.
 - b. 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.

The characterization of a proposition as being 'at issue' will thus guide the conversation participants in the identification of the QUD. Grammatical devices that contribute to identify what is or is not at issue will thus contribute towards this goal.

Before turning to a discussion of *if*-constructions in the next section, let us quickly illustrate the model at play with a simple example. Assume the utterance in (32) out of the blue (i.e. there is no explicit question this is an answer to).

- (32) John plays [SOCCER]_F.

Given the Congruence constraint and focus marking, the utterance in (32) will be felicitous only if there is a question in discourse of the form *What does John play?* Incorporating Congruence into the model of dynamic update amounts to conveying that the utterance in (32) triggers the presupposition that $top(Q_i)$ is a question of the form *What does John play?* In the absence of an explicit question, this will need to be accommodated and, following Biezma and Rawlins (2017), we characterize accommodation as in (33):

- (33) **Accommodation.** If φ presupposes ψ and ψ is not satisfied in l , first update l so that ψ is satisfied.

For our example in (32), this means that before proceeding with the dynamic update triggered by the utterance, participants need to accommodate that the question at the top of the stack is a question of the form

²⁷This focus presupposition is triggered by the ' \sim ' operator in the Roothian system. We simplify here and do not introduce this additional formalism in an attempt to keep things as simple as possible. See Biezma (2019) for a detailed account.

What does John play?, (34a-i). Once this is done, we can proceed with the dynamic update of the declarative. The declarative proposes that the cs_{F_c} in the context resulting after the accommodation be updated with the information that John plays soccer, (34a-ii). Upon acceptance, $top(Q'_c)$ is resolved and hence the question is popped ($pop(Q'_c)$). The resulting question stack is then as it was before the (declarative) move was made, (34b) ($Q_{c_2} = Q_c$) (details here are from Biezma 2019).

- (34) Let $c = \langle a, cs_F, L, Q, \emptyset \rangle$ be the initial context:
- a. $c + \lceil \text{Assert}(\text{John plays } [\text{soccer}]_F) \rceil$
 - (i) Accommodate that the local context is $\langle a_c, cs_{F_c}, L, Q'_c \rangle = l'_c$ (Focus anaphora)
s.t. $Q'_c = push(Q_c, \llbracket \text{what does John play?} \rrbracket^o)$, i.e. $top(Q'_c) = \llbracket \text{what does John play?} \rrbracket^o$
 - (ii) Propose the update of cs_F (with the answer) (Assertion)
 $\langle a_c, cs_{F_c}, L_c, Q'_c, \langle l'_c \oplus \lceil \text{John plays } [\text{Soccer}]_F \rceil \rangle \rangle$
 $l'_c \oplus \lceil \text{John plays } [\text{Soccer}]_F \rceil = \langle cs_{F_c} \cap \llbracket \text{John plays } [\text{Soccer}]_F \rrbracket, Q'_c \rangle$
 - b. Acceptance: Accept the proposed future context and $pop(Q'_c)$:
 $c_2 = \langle a_c, cs_{F_c} \cap \llbracket \text{John plays } [\text{Soccer}]_F \rrbracket^o, L_c, Q_c, \emptyset \rangle$

At the end of the process, the only element in which we can appreciate a change with this simple declarative is cs_F (there is no trace left of the intermediate accommodation of the question presupposed via focus anaphora).

In the next section we discuss the mapping between conditionals and discourse structure within the running model. Our proposal will appeal to Roberts's characterization of the QUD as the 'not at issue' meaning of an utterance and will draw on 'Relevance' and 'Congruence' to capture the special effects associated with BCs.

3.1.2 Mapping *if*-constructions to discourse

In our proposal the key to an account of the 'special effects' obtained with BCs is a good understanding of how they map to discourse structure and the inferences that can be drawn from that mapping. Starr (2014b) already pointed out that the interaction between BCs and discourse is important in their overall interpretation (see also Ippolito 2016 for additional points). In this section we investigate the mapping of *if*-constructions to discourse, for both BCs and HCs, and exploit it as the source of the inferences triggered.

The literature on *if*-constructions has long recognized an asymmetry between antecedents and consequents in terms of information structure and discourse status. It has been argued since Haiman (1978) that the *if*-clause is usually understood as the *topic* of the utterance, with the consequent focused (see also Ebert et al. 2014 a.o.). In terms of a theory of discourse as presented in §3.1.1, the *if*-clause would correspond to 'not at issue' content, to be characterized as the QUD in Roberts's model (as seen in (31) above). This means that when speakers map the utterance of an *if*-construction to discourse, the antecedent is by default understood as identifying the QUD that is addressed by the consequent ('at issue' content). Understanding that the consequent in an *if*-construction is focused triggers a presupposition regarding $top(Q_c)$, identified by the antecedent. From this perspective, the utterance of an *if*-construction constitutes a complex move by which the speaker both sets up a QUD and answers it. In this sense, it overtly specifies the discourse question to which the answer is subordinated.²⁸ The mapping between *if*-clauses and QUDs (the focus-presupposition regarding $top(Q_c)$), as well as the mapping between consequents and answers, is considered a default mapping. It has been noted in the literature that both the context of utterance as well as linguistic devices (e.g. focus particles) can reverse the mapping (see a.o. von Stechow 2009, Biezma 2011b,a). However, as we will see in §3.1.3, only this mapping to discourse is available to BCs.

²⁸That this is done via syntactic structure and not prosody (as seen in the example above in (32)) may be seem odd, but *if*-constructions are not different from other linguistic devices that serve such purpose. See for example *Regarding the concern on adverse ecological impacts, AFCD advises that cropping activities could co-exist with conservation*. Other similar cases include *With respect to... , in relation to... , which serve a similar purpose*.

What is the QUD set up by the antecedent *if*-clause? In terms of the semantics, the consequent in an *if*-construction ‘*If p, q*’ spells out a property common to all antecedent-worlds. The QUD set up by the antecedent will thus be about a property that all worlds selected by the antecedent have. We can intuitively characterize it as ‘*What do the selected p-worlds look like?*’ / ‘*What is true at the selected p-worlds?*’. In what follows we take the shortcut of paraphrasing the question as *what if p?*, although we will see that this is not always a suitable overt paraphrase (see §3.2.1 below) and that the overt question may introduce additional inferences (see Rawlins 2010b; Bledin and Rawlins 2017). Here is a simple illustration of mapping to discourse with a HC *if*-construction (sketching the view that the question corresponds to the set of possible answers, modeled as propositions):

- (35) *If p, q*
 QUD: What do the selected worlds in which *p* is true look like? / $\{r : \text{for all selected } p\text{-worlds } w, r(w)\}$
 Answer: They are *q* worlds./ *q*
- (36) *If it rains, I wear my hat.*
 QUD: What do the selected worlds in which it rains look like? (“What if it rains?”)
 Answer: I wear my hat.

As it stands, the questions introduced by the antecedent appear very vague. The selected antecedent worlds have many properties, they ‘look like’ many different things. We certainly do not take an utterance of an *if*-construction to be a question about all of them (we do not take the proposition that I wear my hat in (36) to be the only true proposition in all the selected worlds in which it rains). However, constraints on discourse structure guide our identification of the specific QUD posed by the antecedent. This is because as well as spelling out the QUD and thus raising an issue, a speaker who utters an *if*-construction provides the answer and thus the at-issue content. General constraints on discourse structure such as Relevance, as encoded in (26) and (25) above, and Congruence guide our interpretation allowing us to enrich the QUD. Understanding that the consequent provides the answer allows us to understand the intention of the question. For an example like (36), understanding that the information the speaker wears her/his hat solves the question raised by the antecedent allows us to understand that the intended question involved how the speaker is protected from the rain (*What do the selected worlds in which it rains look like in terms of how I protect myself from the rain?*) not just the general question what do the selected worlds in which the antecedent is true look like. In this way, discourse felicity constraints allow us to recover the specific goals the speaker had in mind in setting up a (in principle) rather vague QUD.²⁹

Let us consider now the case of BCs, beginning with the classic example:

- (37) *If you are hungry, there are biscuits on the sideboard.*
 QUD: What do the selected worlds in which you are hungry look like? (“What if you’re hungry?”)
 Answer: There are biscuits on the sideboard.

As in the case of other *if*-constructions, the felicitous utterance of the BC requires that we understand that (discourse) Relevance is obeyed. That is, the consequent must provide an answer (if indirectly) to the question set up by the antecedent. As in the previous example, that the consequent provides an answer guides us in identifying the QUD - the issue that the speaker has the intention of addressing. The fact that the answer is a statement regarding where food can immediately be found by the addressee indicates that

²⁹The 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.

the antecedent is understood as a QUD regarding selected worlds in which the addressee is hungry and wishes to find food, presumably to remedy the problem of being hungry. The fact that the consequent is provided as an answer to that question allows it to be easily understood as a suggestion by the speaker that the addressee take the biscuits. The ‘suggestion’ flavor of the BC is derived from our efforts to reconstruct the consequent as a (discourse) relevant answer to the QUD posed by the antecedent. That the utterance of the BC is understood as a suggestion is not conventionalized, i.e. built into the semantics, of BCs, but arises as a case of pragmatic enrichment derived from independently justified constraints on discourse structure.

Many factors affect the inferences drawn regarding the consequent and contextual knowledge will play a very important role in the reconstruction of a relevance relation between antecedent and consequent, allowing the same *if*-clause to be used to introduce different issues (i.e. different sets of possible answers, which amounts to overall different QUDs). Imagine a scenario in which a patient is given a prescription for a drug that will make him hungry and a specific treatment has to be initiated when this effect manifests itself. Since it is very difficult to anticipate when that may be, the addressee is sent home until that moment arrives. The nurse tells the addressee:

(38) Go home, and if you are hungry in a couple of hours, the doctor’s number is jotted on the prescription.

QUD: What do the selected worlds in which you are hungry and wish to communicate this to the doctor look like?

Answer: The doctor’s number is jotted on the prescription.

Here, a different inference arises with the *if*-clause *if you are hungry*. The message is not that the doctor is going to solve the hunger or that calling the doctor would solve it (nor that the patient eat the doctor’s phone number!). Given the QUD recovered in this context, the consequent is interpreted in an entirely different way: as a command to call the doctor so the treatment can start.

Given our proposal to link BC inferences to discourse-felicity, the immediate prediction is that the inferences we associate with BCs will be triggered with parallel discourse-structures that may arise with regular question-answer pairs. This is indeed borne out:

(39) A’s father is going out tonight:

B: I’m leaving!

A: Wait! You didn’t prepare me any dinner. What if I’m hungry?

B: There are biscuits on the sideboard.

↪ I suggest/allow you to eat the biscuits on the sideboard.

As (39) illustrates, the suggestion inference associated with the answer to the QUD arises independently of the BC *if*-construction. Indeed, it is possible to reproduce the observed range of BC inferences with discourses consisting of regular question-answer pairs (e.g. (41a)) or any other exchange in which similar goals can be reconstructed (e.g. (40), (41b)).³⁰

(40) A: I’m hungry.

B: There are biscuits on the sideboard.

↪ I suggest/allow you to eat the biscuits on the sideboard.

³⁰That the conditional form gives rise to the same inferences as the distributed fragments has already been observed in (Starr 2014b, 18). There are, however, several differences between Starr’s (2014b) proposals and the one in this paper. Most importantly, Starr establishes in the semantics of the *if*-constructions that the antecedent signals the question being addressed. It is not clear to us whether his proposal can be modified to allow for the required flexibility in the mapping between *if*-constructions and discourse necessary to derive cases of classic conditional perfection à la von Stechow (2009) (see example (44) below).

- (41) If they ask you how old you are, you are four.
 ~→ I command you to say that you are four
- a. Son: Dad, what if they ask me how old I am?
 Dad: You are four.
 ~→ I command you to say that you are four.
- b. Son: The ticket collector is coming.
 Dad: You are four (remember).
 ~→ I command you to say that you are four.

The fact that the types of inferences / flavors associated with BCs are similar to those that arise in parallel discourse configurations in spite of differences in structure suggests that a common discourse-level explanation can be found for the effects across the board (independently of the BC structure). A characteristic feature of the Relevance-triggered inferences in all such cases is that they appear to become part of the common ground and cannot (easily) be cancelled.³¹ This is illustrated below. Suppose that A eats the biscuits following B's utterance in (42), it would be odd for the speaker to scold her afterwards:

- (42) A: I'm hungry.
 B: There are biscuits on the sideboard.
 [A goes to the kitchen and eats the biscuits.]
 B: You ate the biscuits!! #Why did you do that?!/# Who gave you permission?!

The inference could have been cancelled if it had been done right away: *If you are hungry, there are biscuits on the sideboard. But they are not mine, you should inquire whether you can eat them.* In this case, the speaker is making clear that even though s/he is reporting that there are biscuits on the sideboard, and conveying that they can potentially solve the hunger problem, s/he is in no position to decide what can be done with them and hence is cancelling the permission inference that would have been triggered otherwise. Crucially, the same is observed in (39) and (40): cancellation is possible if it is done right away, but not a while afterwards.

Our proposal links the interpretation of BCs to general theories of discourse coherence and pragmatic enrichment arising from the identification of the speaker's intentional goals. The proposal is that we should map BCs to discourse as a complex question-answer move and understand the associated inferences as enrichment in the same manner. We strive to build a relation between antecedent and consequent that will allow us to understand the consequent as an answer relevant to the QUD raised by the antecedent. When we are not capable of building such relation, we find both *if*-constructions and question-answer pairs infelicitous (as expected). Consider the *if*-construction (from Sano and Hara 2014) and dialogue examples in (43):

- (43) a. If France is hexagonal, there is beer in the fridge.
 b. A: What if France is hexagonal?
 B: There is beer in the fridge.

Imagine that we do not know whether France is hexagonal. Our interpretation of (43a) would normally be a BC-interpretation: our c_{SF} contains both worlds in which France is hexagonal and worlds in which it is not, and whether there is beer in the fridge or not will be factually independent (L only contains worlds in which these facts are traced to different bases). However, an utterance of (43a) (as well as B's response in (43b)) would be infelicitous in most contexts (though even in those contexts the addressee would learn that there is beer in the fridge, regardless of her/his perplexity.) Why? Sano and Hara 2014 leave the question of

³¹See Biezma et al. (2012); Arregui and Biezma (2016) for a discussion on discourse manners and non-cancellable implicatures in conditionals and Lauer (2014) for a discussion on "mandatory implicatures" in general and why they result in infelicity or oddness if the implicature is known to be false.

infelicitous BCs un-answered. The reason for the infelicity, according to our proposal, is that it is very hard to understand how that there is beer in the fridge can be understood as providing an answer to the question it is taken to address: *What do the selected worlds in which France is hexagonal look like?* (no matter how hard we try with pragmatic enrichment). Of course, with the right context, it could work. Imagine that we are playing a game in which you have to guess the various shapes of countries and beer is the prize that will be in the fridge if you get them right. In this scenario, the examples in (43a) and (43b) become felicitous (and not BCs).

Our discussion so far has focused on inferences regarding the status of the consequent in BCs. We have noted that the range of possible inferences is quite rich (permissions, commands, suggestions, etc.) and that they can be rather indirect, depending on our ability to reconstruct a relation of relevance between the consequent and a QUD posed by the antecedent (note that while we have appealed to relevance, the issue of how the relevance relation itself is built is beyond the scope of this paper). In our proposal, indirect speech acts are derived by a mechanism of pragmatic enrichment. There are potentially different ways to spell this out (e.g. within Asher and Lascarides's (2001) discourse relations framework or in a decision theoretical approach). While we do not commit to a specific proposal here, we favor an approach to indirect speech acts that makes use of tools from decision theory (see van Rooij 2003; Benz and van Rooij 2007; Benz 2006 and especially Stevens et al. 2014). On these proposals indirect speech acts have to be considered as indirect answers that pertain to decision problems. We take the central insight to be that preferences that are elements of agent's goals are a central element in deriving the specific force of an utterance, which is e.g. implemented in Justin Bledin (forthcoming). In a slightly different setting, this insight is also used in Condoravdi and Lauer (2011, 2012, 2017) to derive the different forces of imperatives. In a dynamic setting, Murray and Starr (2018) have also pointed to the role of preferences in deriving force. (While we cannot go into this issue further here, see Goebel (2019) for an elaboration on the mechanism of pragmatic enrichment in BCs.)

Let us point out that inferences also arise regarding the status of the consequent in the case of HC *if*-constructions '*if p, q*', in which we infer or already know that the antecedent and consequent are dependent. In such cases, the inference that is triggered may be that *q* is a consequence of *p* (as in (36)). Given that the dependence relation is the result of our knowledge about factual dependencies, the inference of causality is easier to arrive at and impossible to avoid. In the case of BCs, inferences are less 'direct': given that we discard a dependence relation between antecedent and consequent, we need to build a discourse relevance relation between the question presented by the antecedent and the answer provided by the consequent by taking into account the utterance situation and our assumptions about the likely goal the speaker may be pursuing.³²

³²Ippolito (2016) also considers the mapping of BCs into discourse and their differences in interpretation with HCs in a short note on relevance conditionals, although her overall proposal is rather different. Ippolito (2016) proposes that *if*-constructions of the form *if ϕ , ψ* address a 'conditional question' of the form *if ϕ , $Q?$* , where ψ is a possible answer to Q . The BC in (1), for example, is taken to address an ongoing QUD that can be paraphrased by 'If you are hungry, is there anything to eat?'. The BC addresses this question by offering the 'premise' in the consequent that, indirectly, answers it. It is not clear to us how this question is identified in Ippolito's system, i.e. what are the conventional cues in the information structure of the utterance identifying that such is the inquiry being addressed, which is essential within the QUD model. In addition, given the arbitrary choice of question, it is not clear to us how this system would account for cases of 'classic' conditional perfection in HCs like (44), or cases of 'biscuit perfection' (see §Biezma and Goebel 2016), which are explained by assuming a mapping to discourse that does not involve conditional questions but a classic information-structural division of labor between antecedent and consequent like the one explained above and adopted in this paper. Indeed, as we will see, classic conditional perfection require the system to be flexible enough to allow the opposite mapping, one in which the consequent provides the QUD and the antecedent provides the answer. In addition, Ippolito (2016, 56) also aims to offer an explanation as to why some *if*-constructions have a 'causal' interpretations while others don't: "The proposal that I would like to make is that the difference between causal and non causal counterfactuals lies in their relation to the [QUD]. A causal counterfactual answers the [QUD] *directly*, whereas a non-causal counterfactual answers de [QUD] *indirectly* by spelling out a premise assuming which the [QUD] is then answered." In our system, causality is also an inference, but it does not result from the utterance providing a direct answer. In our account, that the HC is taken to provide a *direct* answer to a QUD is the byproduct

3.1.3 The other mapping

We have accounted for the special flavors of BCs on the basis of a default mapping for *if*-constructions according to which the consequent answers a QUD posed by the antecedent. However, there being a default does not rule out other options. So far, nothing prevents *if*-constructions with independent antecedent and consequent from having a different mapping to discourse. To claim that the default mapping is one in which the *if*-clause introduces a QUD merely means that in order to obtain a different mapping, one in which the at-issue content is the proposition denoted by the *if*-clause, we would need help from context (von Fintel 2009) or, alternatively, to force it linguistically, e.g. by using focus particles (Biezma 2011a,b). The following example illustrates the former strategy:³³

- (44) A: When would you give me \$5?
 B: If you mow the lawn, I'll give you \$5.
 ~→ If you don't mow the lawn, I won't give you \$5.

In (44) the context establishes that we are wondering about the circumstances in which B receives \$5, and hence the QUD is in the consequent. Following von Fintel (2009), when the antecedent is understood as providing an exhaustive answer to the consequent question, we obtain (classic) perfection, i.e. a strengthening inference that the antecedent provides not just sufficient conditions but also necessary conditions.³⁴

What about BCs? It has been already claimed in the literature (without further explanation) that BCs do not trigger classical inferences of conditional perfection (Francez 2015). Why is this? The answer, in short, and assuming that classic perfection is triggered as proposed by von Fintel (2009), is that BCs can never convey exhaustive answers to such questions: given that in BCs we conclude that the consequent is true (and hence c_{SF} only includes worlds in which the consequent is true, even if an *if*-construction with BC interpretation were felicitous as an answer to a question about the consequent, the antecedent could never be understood as providing the only circumstances in which the consequent is true. Hence, classic perfection could never be obtained.

That BCs do not perfect only means that the answer provided by the antecedent could not be interpreted exhaustively, not that the mapping of BCs to discourse would not be one in which the antecedent provides the answer to a QUD introduced by the consequent. So, why wouldn't BCs allow the non-default mapping into discourse? Given that non-BCs allow for this mapping to discourse, the answer should be obtained from the particularities of *if*-constructions when they are interpreted as BCs, i.e. from the fact that antecedent and consequent are taken to be factually independent and from the fact that the context update by the consequent in BCs affects the entire context set and is not limited to the temporary context in which there are only antecedent-worlds.

of there being a dependence relation between antecedent and consequent.

Overall, Ippolito (2016) is not devoted to BCs but aims to explain how context dependence allows us to identify the premises relevant in the interpretation of counterfactuals. We leave for future research the investigation of her claims with the mapping between *if*-constructions and discourse proposed here.

³³It is not clear to us why the default mapping is one in which the *if*-clause introduces the QUD. It may be due to the fact that the antecedent is the restrictor of the modal, and restricting the domain of quantification is usually thought as previously agreed upon. Alternatively, it may be the result of understanding the main clause as usually conveying the main-point of the utterance (the at-issue meaning), while adjuncts are more easily understood as constraining the main claim. What is important is that this is a tendency, not something that is conventionally indicated by the linguistic form, and hence it can be transgressed.

³⁴Given our view that discourse-driven effects can replicate across constructions, it is interesting to see that we find instances of 'perfection' in other types of quantificational statements (not only conditionals). Consider (i) (from the movie *Logan*, 2017):

- (i) A: Everyone I care about dies.
 B: Well, then I should be perfectly safe.

In B's response we understand that s/he has perfected A's claim to understand that only the people A cares about dies.

Let's start by establishing what would be the QUD that the utterance of a BC *if p, q* would be addressing if we were to assume that the mapping were the non-default one. Given the semantics of *if*-constructions, the QUD would be asking 'what are the propositions *p* such that for all selected worlds in which *p* is true, *q* is true?' There are in principle different propositions. This is the reading that we paraphrase by *when q?* (notice however that this linguistic counterpart of this specific (discourse) inquiry may not always be suitable, as noted above with the "what if?" paraphrase) and this is the reading we take the question in (44) to encode. Let's imagine the spelled out question/answer pair that the non-default mapping of the *if*-construction would indicate:

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

When what we want to learn is which worlds are such that there are biscuits on the sideboard, it is relevant to learn whether in all worlds in the selected domain (cs_F) there are biscuits on the sideboard or whether that is not the case, and if the latter, it is relevant to learn what are the worlds in which there are biscuits on the sideboard. The response (which can be paraphrased roughly by "the (selected) worlds in which you are hungry are worlds in which there are biscuits on the sideboard") only provides the information indirectly, i.e. we only learn that all the worlds are such that there are biscuits on the sideboard via the strengthening process observed in BCs that we described in §2 for all BCs. The only advantage of uttering the *if*-construction in (45) over the bare matrix clause plainly stating that there are always biscuits on the sideboard is to provide further information regarding the context set, i.e. providing the information that in particular the worlds in which you are hungry are worlds in which there are biscuits on the sideboard, but this is not information that was asked for or that is necessarily relevant to the addressee to begin with. The plain declarative *there are biscuits on the sideboard (right now)* would have been enough. We can then convey the same information in simpler way without anything being gained by uttering the more complex form. In this situation the more complex expression is blocked (this can be derived in a number of different ways within a neo-Gricean framework, see Potts 2006 and references therein, and see Nouwen 2015 for a similar argument).

3.2 Some special cases

In this section we will extend our proposal to two different cases, with the goal of illustrating our analysis and its potential. In §3.2.1 we will examine the case of 'hedging' BCs, which pose well-known problems. We will suggest that these could receive a natural account within our theory with the incorporation of a performative dimension. In §3.2.2 we will examine examples that fall under the BC definition we have provided but that do not standardly form part of BC discussions. These examples differ from more typical examples in that the antecedent does not seem to establish relevance. Yet, we will argue, our discourse-based analysis sheds light on their interpretation.

3.2.1 Discourse hedging BCs

If-constructions like (46) have a meta-discursive function.

- (46) a. If I'm being frank, you look tired.
b. If you want to hear a big fat lie, George W. and Condi Rice are secretly married.

These *if*-constructions have traditionally been studied within the category of BCs and, given that they have an independent antecedent and consequent, they are also BCs given our definition. However, they present special theoretical challenges. One important question, for example, is how to explain that what we take away from (46b) is that it is a lie that George W. and Condi Rice are secretly married. Siegel (2006) actually introduced this example to argue against theories of BCs claiming that the consequent is entailed. Notice

that applying naively a mapping of BCs into discourse in the way we introduced above would not deliver the right results:³⁵

(47) QUD: What do the selected worlds in which the speaker tells a big fat lie look like?

Answer: These are worlds in which George W. and Condi are secretly married.

The mapping in (47) doesn't explain the inference triggered in (46b) that it is a lie that George and Condi are secretly married. What we need in order to obtain the right interpretation is something different: we need to derive that the worlds in which the addressee wants to hear a big fat lie are worlds in which the speaker *says* that George and Condi are secretly married. Notice that in both examples in (46) there is something performative: what we take away is not the literal meaning of the consequent alone, but that the speaker uttered the consequent. In the case of (46a) the speaker is being frank by *saying* something (uttering the consequent), and in the case of (46b) the speaker is satisfying the addressee's wishes by *saying* something (uttering the consequent). Our suggestion is that an account of these examples could be incorporated in our proposal with an adequate understanding of the performativity introduced by predicates evoking the act of utterance in the antecedent (e.g. *hear*, *being frank* above) (but this lies beyond the scope of this paper and left for future research).

Notice that in these cases too we arrive at the conclusion that the *if*-construction at hand is a BC due to the independence of the propositional content: whether the speaker is being honest or not is independent from how the addressee actually looks or from the marital status of other people. However, when we interpret these BCs we also get into consideration that the response is stated in the context of the question set up by the antecedent: a context in which the speaker is now saying something being frank or telling a lie. The (informational) update driven by the semantics of the *if*-construction is done as in every other *if*-construction, but discourse considerations (that the consequent is the response given to the question stated in the antecedent, i.e. the consequent is discursively subordinated to the QUD indicated by the antecedent) are crucial to determine the status of the information in the consequent. The result is that, for example, in (47) we understand right away that the speaker is lying when saying that George W. and Condi are married and hence that the update to be performed is that the propositional content of the consequent is not true. That is, the global update driven by the independence assumption is made with the information that the consequent is false. Importantly for us, what we observe in (47) is also what we observe in question answer pairs:

(48) A: I want to hear a big fat lie. / I want you to tell me a big fat lie. / What if I want to hear a big fat lie?

B: George and Condi are secretly married.

To account for these examples it is crucial that we keep track of the context in which the utterance of the declarative is made: we need to keep record of the fact that that George and Condi are secretly married has been claimed as a request to hear a lie. This is possible in the QUD model, where information in the common ground is (hierarchically) structured. When asking a question, just as in the Stalnakerian account of common ground, it becomes part of the common ground that the question was asked and, additionally, we keep track of posterior responses to the question as exactly that, responses to "that" question.³⁶ Information is structured and we do not only keep track of what was said, but also of the context in what it was said, that is, of the question that was being answered.

Notice that this is not the same as claiming that the consequent introduces a different speech act. Ebert et al. (2014), for example, need to appeal to a speech act that is not "a run of the mill assertion" to explain (46b): a speech act that involves a 'false assertion'. In our proposal, we interpret the *if*-construction in the

³⁵Notice that our "what if *p*?" shortcut to spell out the QUD is not as well suited as an overt question in these cases.

³⁶See for example Lauer (2013) for a formalization.

same fashion we interpret other *if*-constructions, arriving to the global update in the same way we do in other BCs. The additional overall meaning in our proposal is the result of understanding that the consequent has to be discursively interpreted in the context posited by the question introduced in the antecedent: a context in which the addressee is saying a lie (and hence conveying that it is not true that George W. and Condi are married) or being frank, in the examples above.

Assuming that these *if*-constructions have a performative dimension predicts that discourse hedging BCs are constrained regarding their temporal anchoring, and this is indeed what we find. Csipak (2015) makes the empirical observation that discourse hedging BCs, unlike other BCs, cannot shift to the past:

- (49) a. If you are hungry, there is pizza in the fridge.
b. If you were hungry yesterday, there was pizza in the fridge.
- (50) a. If I am being frank, you look tired.
b. ?If I was being frank yesterday, you looked tired.

While much more has to be said about these BCs, we suggest that shifting discourse-hedging BCs to the past is not possible due to their performative nature: the speech act is anchored to the utterance time and not all past possibilities in the *if*-constructions are available. Notice that when the anchoring of the speech act is in the past itself, past tense is perfectly fine:

- (51) Everybody was very liberal and went to bars in those days. If they asked us how old we were, we were eighteen.

The interpretation in of (51) is that what the speaker said when questioned about age at those times was that s/he was eighteen, although it was not true at the time. Since the speech act is now in the past (it is the response given back in those days when asked about age), the antecedent can be (must be!) in the past as well. (50b) is bad because there is a mismatch: the speech act (the speaker saying that the addressee looked bad in the past) is anchored to the utterance time while the antecedent tries to place it in a past time yesterday (see Csipak 2015, 2017 for a different proposal).

This is certainly far from a full account of discourse-hedging cases. Our only goal in this section has been to show that discourse effects, once more, can be separated from the semantics of BCs once we understand that the antecedent of BCs sets up the context for the interpretation of the consequent. The prediction is that the effects observed are then the same as observed in question-answer pairs, and this is borne out.

3.2.2 BCs that do not establish relevance

It is worth noting that the *if*-constructions that have been classically studied in the literature on BCs are not the only ones where antecedent and consequent are independent and we will briefly discuss some examples here. In these cases, the intuition is also that our beliefs about the consequent proposition are unaffected by our beliefs about the antecedent.

What is interesting for us is that in these cases the role of the antecedent of the *if*-construction does not (always?) seem to be to establish relevance. Consider the following example:

- (52) A: Oh look at the weather! It's probably going to rain. Poor Betsy is still out there. She will get completely soaked.
B: Don't worry. She has her umbrella.
A: But the poor child! This is terrible! Dreadful!
B: Stop exaggerating. If it rains, she has her umbrella.

As before, we understand that the antecedent of the *if*-construction establishes the QUD for which the consequent is interpreted as the answer. What is different from other textbook BCs in this case is that B's

utterance of the *if*-constructions is not meant to establish relevance in the discourse, that is, to establish why the speaker conveys that Betsy has her umbrella (this was already clear!). B's point in uttering the BC is to emphasize that Mary has her umbrella. The speaker could have uttered the declarative alone, but by uttering the *if*-construction the speaker further makes the point that the question 'what if it rains?' has already been answered above by the statement that Betsy has her umbrella. The *if*-construction helps reinforce the point that the answer to the ongoing question has already been provided and is time to move on.

Examples like these are interesting in showing that in addition to 'classic' BCs, the BC family also includes members that appear to give rise to other effects. Our discourse-based proposal appealing to coherence between a QUD and its answer is able shed light on a range of data that goes beyond the classic examples in which the BC serves to establish relevance.

3.3 Interim conclusion

We have argued above that inferences triggered by the utterance of *if*-constructions (whether they are permission, orders, etc. in BC, s or causality in HCs) are the result of the mapping into discourse as well as considerations regarding the relation between the antecedent and the consequent. We have seen that the same inferences are triggered when we have the equivalent question/answer pair.

The recurring underlying claim in the previous section has been that discourse mapping provides a species of discourse-subordination. Given the lack of dependence between antecedent and consequent (or rather, the presupposition of independence), what we learn from the utterance is the quantificational claim conveyed in the semantics of the *if*-construction and the additional inferences provided by discourse interpretation. In the following section we argue that the need to appeal to the mapping of *if*-constructions to discourse is independently needed to explain cases of inference-perfection.

4 Comparison with syntactic-driven accounts of BCs: V2, *Then* and commands

There are several proposals in the literature that argue that the interpretation of *if*-constructions is guided by syntactic clues (see Köpcke and Panther 1989; Ebert et al. 2014). This work is supported by data found in German, a V2 language, where it appears to be a syntactic difference between BCs and HCs (examples from Ebert et al. 2014):

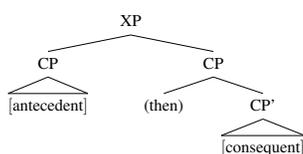
- (53) Wenn Du mich fragst, was ich von Dir denke, (dann) bist Du ein Idiot.
 if you me ask what I of you think then are you a idiot
 'If you ask me what I think of you, then you are an idiot.'
- (54) Wenn Du mich fragst, was ich von Dir denke, Du bist ein Idiot.
 if you me ask what I of you think you are a idiot
 'If you ask me what I think of you, you are an idiot.'

Ebert et al. (2014) (henceforth EEH) argue that the interpretation of (53) is unambiguously that the speaker's attitude depends on whether the addressee has asked what is thought of him, whereas (54) always conveys that the speaker thinks that the addressee is an idiot (independently of whether he asked or not). Crucially, in (53) the consequent exhibits V1 (i.e., German is a V2 language and in (53) the verb is the first word of the consequent, making the antecedent to count as the first constituent of the clause), whereas in (54) the consequent has the verb as the second word, indicating that the consequent is syntactically detached from the antecedent and forms an independent clause. Looking at this difference, EEH propose a unified account of the interpretation of *if*-constructions that generates the differences between BCs and HCs by assuming two different LFs. In EEH's proposal, all *if*-constructions have an interpretation in which the *if*-clause

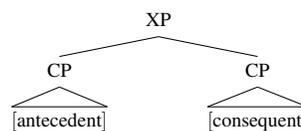
is analyzed as introducing a discourse referent by performing a referential speech act (a speech act that introduces a discourse referent) while the matrix CP introduces a different speech act (either an assertion, a question, etc.). The difference between BCs and HCs is at the level of integration between the two speech acts (encoded in their different LFs): in the case of BCs, the antecedent and the consequent are claimed not to have any further (interpretative) relation than the fact that they are uttered consecutively, whereas in the case of HCs the discourse referent is an argument of the interpretation of the consequent, i.e. the relation between antecedent and consequent in HCs is that of predication (the reader is referred to EEH for further details).

EEH assume that what we observe in German is also what we find in English. According to EEH, the fact that BCs and HCs also have a different LF in English can be seen in the distribution of *then*, which is claimed to be possible in HCs but not in BCs. EEH assume that *then* is merely a proform (following the literature that treats conditionals as correlatives, see [Bhatt and Pancheva 2006](#) for an overview) and its presence/absence at LF (*then* can also be covert) determines whether the consequent is evaluated in the worlds introduced by the antecedent or in the actual world. In EEH's approach *then* merely indicate that the worlds of evaluation of the consequent speech act are the worlds in which the antecedent is true and its presence is what delivers the HCs. EEH propose the following LFs for HCs and BCs (leaving out the speech-act operators):

(55) HCs



(56) BCs



In BCs the speech act introduced by the consequent is semantically independent from the referential speech act in the antecedent, i.e. there is no (covert) *then*, and hence the truth of the consequent is independently asserted from the truth of the proposition in the antecedent.³⁷

EEH extend their proposal regarding the data from German to other languages, concluding that in languages like English it is also the case that there are two LFs available, with different levels of syntactic integration, and that the interpretation of *if*-constructions as BCs correspond to the LF with less integration.

It is easy to see how EEH's account would derive that the content proposition in the consequent is updated in the entire context set (consequent entailment), since the speech act of the consequent is performed in the actual world and not in the worlds identified by the antecedent. In addition, in EEH's proposal different flavors in BCs arise by stipulating different speech act operators heading the clause. We will turn to the case of 'biscuit perfection' later in the paper where we will argue that to explain this phenomenon in *if*-constructions proposals such as EEH's would still need to appeal to the pragmatic machinery we use in this paper, that also explains the other phenomena.

4.1 Word order is not a definitive criterion

A prediction from EEH's proposal is that all V2 *if*-constructions are interpreted as BCs whereas all V1 are interpreted as HCs. However, as it has been pointed out in the literature, this prediction is not borne out (see [Köpcke and Panther 1989](#); [Franke 2009](#); [Csipak 2015](#), a.o.). The (b) examples below are V2 *if*-constructions with HCs readings just like the reading of their V1 counterpart in (a) (examples below are from [Köpcke and Panther 1989](#); [Franke 2009](#) and [Csipak 2015](#) respectively):

- (57) a. Wenn er das erfährt, gibt es Ärger.
if he this realizes gives it trouble

³⁷EEH also link the presence of *then* to 'causality' in passing, but they do not explain where the 'causal' meaning is coming from: *then* is only a proform in their account.

- b. Wenn er das erfährt, das gibt Ärger.
if he this realizes it gives trouble
'If he finds this out, there will be trouble.'
- (58) a. Wenn du auch nur in die Nähe, meines Autos kommst, spuck ich dir in deine Suppe.
if you also only in the vicinity my car come spit I you in your soup
b. Wenn du auch nur in die Nähe, meines Autos kommst, ich spuck dir in deine Suppe.
if you also only in the vicinity my car come I spit you in your soup
'If you come anywhere close to my car, I'm going to spit in your soup'
- (59) a. Wenn du ihm davon erzählst, hau ich dir eine.
if you him about tell beat I you one
b. Wenn du ihm davon erzählst, ich hau dir eine.
if you him about tell I beat you one
'If you tell him about it, I'll beat you!'

The fact that German speakers have no problem understanding the V2 constructions above as HCs indicates that the interpretation of *if*-constructions as HCs or BCs is not tied to the syntactic structure (and hence to different LFs). In fact, we can also find the flipped side of the coin, cases of V1 *if*-constructions with BC interpretations:

- (60) a. Wenn du Hunger hast, da ist Pizza im Kühlschrank.
if you hunger have there is pizza in the fridge
b. Wenn du Hunger hast, ist da Pizza im Kühlschrank.
if you hunger have is there pizza in the fridge
'If you are hungry, there is pizza in the fridge.'

Notice also that the V1 and V2 alternation only applies to declarative matrix clauses. In interpreting *if*-constructions with a question in the matrix clause we cannot rely on such alternation, (62). This is puzzling for EEH's theory given that in German, as in English, it is possible to raise a question by using a rising declarative, (61), and one would expect that this could be exploited to encode BC reading, but that is not borne out. *if*-constructions with questions do not depend on word order to be identified as BC-questions, as shown in (64), where we necessarily find V1 order but a BC-question interpretation.

- (61) a. Bleibst du zu Hause? Interrogative clause
stay.2.sg you at home
'Do you stay at home?'
b. Du bleibst zu Hause? Rising declarative
You stay at home?
'You stay at home?'
- (62) a. Wenn John verreist, bleibst Du zu Hause?
if John travels stay.2.sg you at home
b. *Wenn John verreist, Du bleibst zu Hause?
if John travels you stay.2.sg at home
'If John goes on a trip, do you stay at home?'
- (63) If I'm hungry, is there pizza in the fridge?/ there is pizza in the fridge?
- (64) a. Wenn ich Hunger habe, Gibt es Pizza im Kühlschrank?
if I hunger have give.3sg it pizza in fridge
b. *Wenn ich Hunger habe, es Gibt Pizza im Kühlschrank?
if I hunger have it give.3sg pizza in fridge

‘If I’m hungry, is there pizza in the fridge?’

The conclusion from this section is that word order does not determine whether an *if*-construction is a BC or a HC. Word order does not dictate the reading obtained. It seems that in these cases, the only thing we have to go on is the dependence relation between antecedent and consequent, or the lack of it.³⁸ This said, explaining why V2 in German *if*-constructions have a preferred interpretation as BCs is a very interesting question, but one that is beyond the scope of this paper.

4.2 *Then* is possible in BCs

It has been repeated in the literature that one way to distinguish whether an *if*-construction is a HC or a BC is to see whether it is possible to add *then*. The claim in the literature is that *if*-constructions with a HC-interpretation can have *then*, but that this is not the case with BCs. In EEH’s account, (covert) *then* is a proform that links the antecedent proposition to the matrix clause by establishing that the worlds in which the matrix clause is interpreted are the worlds in which the antecedent is true.³⁹ This interpretation needs to be avoided in order to obtain a BC reading in their system.

A problem arises for EEH’s proposal because, despite the often repeated claim, *then* is actually possible in BCs, though there is variability in acceptance. Some English speakers agree with the claim that (65) is marked while its *then*-less version is perfectly fine. However, other English speakers have no problem accepting (65).

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

Speakers who accept (65) take away similar information as the one extracted from the *then*-less *if*-construction: the speaker uttering (65) is informing the addressee of the fact that there are biscuits on the sideboard in case s/he wanted to eat some. These speakers concede that the magical reading in which biscuits will appear as the result of your being hungry could also be conveyed by uttering (65). This reading is however discarded on the basis of implausibility (it would, of course, be possible in a magical world such as a Harry Potter movie). The paraphrase speakers provide to the utterance of (65) is as follows: I am giving you the information that there are biscuits on the sideboard because you may be hungry. This is the paraphrase that is most easily obtained for (66), which even speakers who find (65) marked find perfectly acceptable:

(66) Well, if you insist on knowing my opinion, then I think you are making a mistake marrying that guy.

And here is another example from Davies (2011-):

(67) Steffy: Well, **if that’s it, then I am late for another meeting, so...**
 Hope: Yeah, I think we covered just about everything.
 Steffy: Okay.

(SOAP)

³⁸ EEH offer the following example of a BC question:

(i) If I may ask a stupid question, did Miles Davis ever play in a combo that was led by Thelonious Monk?

In justifying that (i) is a BC they argue that “the speaker is not just asking for the truth of the proposition Miles Davis played in a combo led by Thelonious Monk in the maximal plurality of worlds where she may ask a stupid question, but she performs this question unconditionally in the actual world.” Notice that this explanation has nothing to do with syntax or how the processor identifies that syntactically the *if*-construction is a BC. In fact, the speaker has no way of telling via the syntax whether the question is to be understood as a BC or a HC.

³⁹ Notice however that, even though EEH only treat *then* as a proform, they also make a connection between the presence of *then* and causality (see EEH pg. 374), but nothing is said about how the causal meaning is brought about.

In (66) and (67) we do not have a HC: we do not understand that the proposition in the antecedent and in the consequent are dependent. We also take away that the consequent proposition is true across the board. Both are BCs according to our theory, and we think this is a welcome result since it allows us to explain similarities between utterances like (66) and (67) and their *then*-less counterparts. What *then* does in these examples is to bring about the meaning that “my (discourse) move of stating that you are making a mistake is the result of your insistence on knowing my opinion” in (66),⁴⁰ and that “my (discourse) move of stating that I’m late for another meeting is the result of the understanding that we have already finished our current meeting and this is the reason why I’m leaving right away” in (67) (see also §3.2.1 for other discourse cases). This reading, that the speaker’s move is the result of the antecedent being true, can be cashed out with an account for *then* along the lines of Biezma (2014). In Biezma (2014) *then* is a discourse marker indicating that two elements are in a ‘causal explanatory claim’-relation in which one (the antecedent) provides the ‘reasons’ for the other (the consequent). These two elements can be the propositional content of the antecedent and consequent of the *if*-construction or the making of the particular (discourse) move. This proposal can be implemented in the model of factual dependencies spelled out in §2 and allows us to explain that ‘then’ signals a ‘causal’ relation when there is a factual dependence relation between antecedent and consequent, but has to relate different elements when there is no factual dependence relation. *Then* can be used to indicate that the subsequent move (e.g. that the speaker is saying that s/he thinks that you are making a mistake) is the consequence of/ explanatorily linked to something discursively preceding it (e.g., in (66) what precedes it is the assumption that you insist on knowing her/his opinion). Notice that this means that *then* is possible when we can rescue that interpretation, regardless of considerations about whether antecedent and consequent propositions are or not factually dependent and, hence, of the interpretation of the *if*-construction as BC or HC.

Much more needs to be said regarding *then* and speaker variability, which we must leave for future research. What is important for us is that the availability/impossibility of *then* is not a deal breaker to determine whether the *if*-construction is or not a BC, and this is a problem for EEH’s proposal. The proposal presented in this paper allows for enough flexibility to make the right predictions: whether the *if*-construction is taken to be a BC or a HC is related merely to the participants presuppositions regarding the (in)dependence of the propositional content of antecedent and consequent.

4.3 Utterances with command inferences and no imperative form

One of the most problematic examples for a speech act theory of BCs is (68) (Siegel 2006):

(68) If they ask you how old you are, you are four.

The problem presented by the example is that it can be uttered in a context in which all participants are aware of the fact that the addressee is not four (imagine, for example, that (68) is uttered by a father, who doesn’t want to pay the mandatory bus fare for kids older than four, to his kid, the addressee).

Siegel (2006) used the example in (68) to argue against previous accounts proposing that BCs entail the consequent, and was a direct criticism against theories arguing that the consequent presents a speech act that is performed (see e.g. DeRose and Grandy 1999; Ebert et al. 2014).⁴¹ However, EEH claim that the speech act performed by the consequent is a command, explaining this way also the overall interpretation. EEH’s

⁴⁰The HC interpretation could also be brought about with this utterance, namely that my thinking that you are making a mistake is the result of you wanting to know my opinion, and we can design contexts in which this is available, but the point here is that the most prominent reading in uttering these *if*-constructions with *then* is similar to what we obtain in the *then*-less utterance and we arrive at it by considering the propositional content in the antecedent and matrix clause and their dependence relation or lack of it.

⁴¹McCready (2014) also argues that BCs and HCs have different semantics and that, unlike in HCs, in BCs the consequent is asserted. Support for this claim, he argues, comes from the contrast between (i) and (ii):

(i) If a farmer owns a big piece of property, he usually keeps a donkey. #It lives a free and easy life.

proposal is that we interpret that the consequent is a command because at LF there is a COMMAND speech act heading the consequent. In (68) we understand that the order is that the addressee say that s/he is four.⁴²

There are several concerns regarding this approach. First of all, in EEH's account the prediction is, counter to speakers' intuitions, that the addressee would fulfill/comply with the suggestion only if s/he goes on and tells the ticket-collector that s/he is four, not only if/when s/he is asked. This is so because the only function of the antecedent is to draw the addressee's attention towards the worlds in which the antecedent is true, but the command (in EEH's proposal) is to be fulfilled in the actual world.

A second problem arises regarding what the speech-act operator would look like. Let us look at the example in (69):

(69) If they ask you how old you are, you are at most four.

The interpretation of (69) in most contexts is not that of a command/request to the addressee to say that s/he is at most four, but a command not to say that s/he is an age above four. If we want to use a single COMMAND operator that derives the meaning in (68) and the meaning in (69) we are going to have to make it sensitive to context and to the goals of speakers in discourse, i.e., we want it to make use of a mechanism similar to the one argued for in this paper and that derives all the meanings of BCs without the need of the extra semantic machinery. An alternative to insisting on the COMMAND operator responsible for the interpretation of (68), while trying to keep EEH's spirit, is to argue that the consequent introduces a speech act of assertion and claim that the command interpretation is the result of an indirect speech act (see also Krifka 2014).⁴³ However, in this latter approach two questions would remain open. The first one

- (ii) a. If you're hungry, there are some₁ cookies on the table. They₁ are ginger snaps.
b. If you're free, I'm going to a₁ party tonight. It₁ starts at midnight.

McCready argues that (i) illustrates that in HCs non-specific indefinites introduced in a conditional consequent cannot serve as antecedents for anaphora while the examples in (ii) show that in BCs this is possible.

There are several problems with this argument. First, (i) and (ii) are not minimal pairs. In (i) the indefinite in the consequent covaries with farmer-owning-property cases (this reading is helped by the presence of *usually*) whereas the examples in (ii) do not run in such problem. Differences in judgments are due to this fact. Consider (iii) instead:

- (iii) a. If the farmer sees the plowing is going slow, he buys a new donkey. It must be young so it can help the older ones.
b. Around here, if a fisherman wants to catch a chinook, he brings a red Marabou. He usually sticks it in his hatband.

The examples in (iii) are HCs and are good. The only problem is that the indefinites in the consequent in these examples do not receive a non-specific interpretation. However, notice that contrary to McCready's claim, it doesn't seem that the indefinites in the consequent in the BCs in (ii) or (iii) are non-specific either:

- (iv) a. If you're free, I'm going to a party tonight, either the one at Joe's or the one at Sue's. # It starts at midnight.
b. If you're free Tuesday or Wednesday, I'm going to a party. # It starts at midnight.

If they were non-specific, we would expect the utterances of (iv) to be felicitous, but they are not. Hence, (iii) and (ii) form a minimal pairs and both behave alike leaving us with no argument to support that they have different semantics (and hence with no argument supporting that in the case of BCs the consequent is asserted whereas in HCs it isn't). For the shake of completeness consider (v), a variant of the HC in (i) in which the indefinite in the consequent doesn't covary with farmer-owning-properties and is clearly specific.

- (v) If a farmer owns a big piece of property, he usually feeds a donkey, Platero. It lives a free and easy life.

As expected, (v) is now fine.

⁴²This is a possibility that Siegel had already dismissed, since (68) doesn't behave like an imperative. In particular, the addressee cannot respond to (68) with *No, I won't!* However, further considerations of the data led EEH to argue that Siegel's data-point regarding the response patterns only shows that (68) does not provide an antecedent for VP ellipsis: *No, I won't say that* is actually a possible response to (68). Notice however that EEH are careful to signal in fn. 8 that this is not sufficient to claim that the consequent performs a command speech act.

⁴³Indeed, if one were to adopt a speech act account of BCs, this would be a better approach. One of the main problems of this

concerns the speech act introduced by the consequent, since it cannot be the speech act of ASSERTION (the speaker in (68) is not committing to the addressee being four!). The second question is concerned with how to explain that we infer that the speaker is giving the addressee an order if the speech act is that of assertion.

In our proposal, that the speaker in (68) is ordering the addressee to say that s/he is four upon being asked (and only when being asked) is an inference triggered by understanding the consequent as providing an answer to the question indicated by the antecedent (see (41) above): given that antecedent and consequent are independent, the pragmatic enrichment necessary to fulfill relevance will deliver the inference. In the case in which all participants are aware of the addressee's age and this is older than four, there is no information update. To see this, imagine that all participants know that the addressee is five.

The utterance of the *if*-construction presupposes that there are worlds in the context set in which the addressee is asked about her/his age. To proceed with the update with the *if*-construction we create a temporary context in which there are only worlds in which the addressee is asked how old s/he is. From these worlds we eliminate the worlds in which the consequent is not true: worlds in which the addressee is more than four. This means that we have to ditch all the worlds in the temporary context because in all those worlds the addressee is five. But the update cannot result in a cs_F incompatible with the ticket collectors asking for the kid's age (they are asking everybody!). That cannot be then the full story behind the speaker's intentions in uttering the *if*-construction. Furthermore, the addressee is not ready to give up that s/he is five and s/he knows that the speaker also knows that s/he is five. Given this, the addressee tries to understand why the speaker just uttered the *if*-construction. Given the mapping between *if*-constructions and discourse, the addressee understands that the speaker is commanding that the addressee say that s/he is four, which they know is not true. Hence, the speaker is commanding the addressee to lie.

In the end, an indirect speech act proposal would need an additional pragmatic mechanism similar to the one proposed in this paper. However, if we are relying on pragmatic reasoning to arrive at the final interpretation, what we actually lack is a justification to posit further semantic machinery.⁴⁴

5 Conclusion

This paper aims to make a contribution to our understanding of BCs along various dimensions. Our goal has been to capture BC-interpretation within a unified account of the semantics of *if*-constructions. We have aimed to do so with a relatively sparse semantics, allowing pragmatic enrichment to play a crucial role.

One of our contributions has been to put forward an account of the notion of independence that is relevant to obtain a BC-interpretation for *if*-constructions. Our discussion here has targeted the dynamics of *if*-constructions and the role played by independence in explaining the context-change brought about by BCs. Another contribution has been to distinguish the literal content of BCs from the enriched meanings, providing an account of the latter on the basis of well-formedness constraints on discourse-structure.

The guiding hypothesis has been that different aspects of the overall meaning of BCs arise due to properties corresponding to different systems (e.g. quantificational semantics, dynamics of information update given independence, relevance and congruence in discourse structure). We have shown that the phenomena observed in BCs are in fact more general and can be also observed elsewhere. Inferences triggered in BCs are observed also in question answer pairs and so is the causality inference triggered in HCs. Importantly,

approach to BCs is how to constrain when speakers have to process one speech act or another, or how many different speech-acts there are. For example, in order to explain BCs like *if you want to hear a big fat lie, George W. and Condi Rice are secretly married* (example from Siegel 2006), EEH need to appeal to a speech act that is not "a run of the mill assertion", it is a speech act that involves a 'false assertion'.

⁴⁴In fact, speech act accounts like EEH's would have to rely on those pragmatic mechanisms to explain why *If you are hungry, there are biscuits on the sideboard* is a suggestion/invitation to the addressee to eat the biscuits, not just an assertion of the presence of biscuits on the sideboard. Otherwise they would have to speculate that the interpretation involves simultaneously two speech act operators, one an ASSERTION operator and one a SUGGESTION operator.

what we observe in the interpretation of *if*-constructions is also observed in other quantificational structures. A quantificational utterance such as *every time you talk I cry* can be interpreted as conveying that the speaker crying depends on the addressee's talking, but *every time I go to school there is a strike* is often not interpreted that way. As with *if*-constructions, whether one reading or the other is triggered depends on the assumptions made by conversation participants, not special syntax (and hence semantics). Here is a quantificational example:

- (70) There is a well-known if dubious story that claims that at a concert in Glasgow Bono began a slow hand-clap. He is supposed to have announced: "Every time I clap my hands, a child in Africa dies." Whereupon someone in the audience shouted: "Well fucking stop doing that then."
(George Monbiot, *The Guardian*, Monday, June 17, 2013)

We understand this as a joke. Why?, because there is no plausible (factual) dependence between Bono clapping and children dying: our assumptions discard (factual) dependence between the two facts, i.e. they are factually independent. The speaker making the joke is pretending to ignore that dependence was implausible (knowingly going against the audience's assumptions). The response reveals that s/he is acting as if if Bono's claim could be used to establish a dependence. It is a joke because s/he knows that everybody is aware of the fact that that interpretation is not possible giving our usual assumptions regarding how the world works.

The punch-line is that by considering the contributions made by the different "layers" to the overall interpretation, it is possible to give an account of the overall meaning of BCs without adding ad-hoc complexity to any one layer.

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