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The Free Choice Principle as a Default Rule

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ABSTRACT: It is quite plausible to say that *you may read or write* implies that *you may read and you may write* (though possibly not both at once). This so-called *free choice principle* is well-known in deontic logic. Sadly, despite being so intuitive and seemingly innocent, this principle causes a lot of worries. The paper briefly but critically examines leading accounts of free choice permission present in the literature. Subsequently, the paper suggests to accept the free choice principle, but only as a default (or defeasible) rule, issuing to it a ticket-of-leave, granting it some freedom, until it commits an undesired inference.

KEYWORDS: Defeasibility – default rule – free choice permission – non-monotonic logic – paradox.

1. Introduction

The main topic of this paper is the free choice effect of a disjunctive permission. Let me start with some examples taken from the British National Corpus (BNC):[2]

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[2] The British National Corpus, version 3 (BNC XML Edition), 2007. Distributed by Oxford University Computing Services on behalf of the BNC Consortium. URL: http://www.natcorp.ox.ac.uk/.

(1) You may sit down or stand just as you wish.
(2) You may exchange it or have your money refunded.
(3) You may copy a sound cassette or a video tape or disc for private use.
(4) You may also use a clean spoon or piece of paper.
(5) You may take mathematics with music or politics with personnel management.
(6) You may print/copy/delete either a subset or all of your oldest mail messages.

All these sentences allow an agent to freely choose between two or more options. This so-called *free choice permission* has been extensively discussed in the field of deontic logic. Hans Kamp (1973, 57) used the following example to introduce the paradox of free choice permission:

> (BC) *You may go to the beach or go to the cinema*, I almost told my son Michael. But thought better of it, and said: (B) *You may go to the beach.* Boys shouldn't spend their afternoons in the stuffy dark of a cinema, especially not with such lovely weather as to-day's.

Intuitively, the latter permission is entailed by the former, but not *vice versa*. However, Standard Deontic Logic (SDL; normal propositional modal logic with serial accessibility relation) tells the opposite story. Let (BC) be represented as $P(b \vee c)$ and (B) as Pb (where P is a deontic operator of permission). In SDL Pb implies $P(b \vee c)$ (since the operator of permission is closed under classical consequence), but $P(b \vee c)$ does not imply Pb. However, incorporating the intuition that (BC) implies (B) by adding the corresponding principle into SDL results in a logical apocalypse.

The principle in question is well-known as the free choice principle:

(FCP) $\quad P(\varphi \vee \psi) \rightarrow P\varphi \wedge P\psi$

There has been a lot of pessimism surrounding the intuitively plausible and practically useful[3] FCP. To some extent, the pessimism is justified. Sven

[3] Consider, for instance, its usefulness related to agency. While it may not be clear how to obey some disjunctive commands or how to exercise disjunctive permissions or

Ove Hansson (2013) nicely sums up implausible formulas that can be subsequently derived. One of them has been derived using the FCP and the substitution of equivalents only.[4] For Hansson, this indicates that FCP may be faulty in itself. A different approach suggests the problem should be solved within the domain of pragmatics. Yet different stance was taken by Zimmermann (2000) or Anglberger, Faroldi & Korbmacher (2016), who abandoned the substitution of equivalents, allowing only for the substitution of hyperintensional equivalents. Note, however, that Zimmermann restricted the validity of free choice principle to cases where the person granting permission has the needed authority.

The main idea of the present paper is simple: Let us add the troublesome-yet-intuitive FCP, but only as a *default rule*. To this purpose, a nonmonotonic framework of adaptive logics will be used. Of course, there are many others options. What motivates the choice of adaptive logic is the dynamic character of its logic (see Beirlaen, Straßer & Meheus 2013, 296-298 and Goble 2013a, 338-339). It seems that free choice effect can be cancelled in the process of communication, and again "resurrected" afterwards. As we will see later on, this nicely corresponds to the idea of "marking" in adaptive logics. Furthermore, FCP will be accepted as a *rule*, not as an *axiom*. While in general, if one has a logic which already has Modus Ponens (MP), it makes little difference whether we opt for an axiom in the form of implication and MP, or for a specific rule. Yet some motivations can be provided. One trivial reason is that it is a natural option as soon as one uses adaptive logics. An independent reason: it has some advantages concerning one of the implausible consequences of adding FCP into SDL, Hansson's implausible result 4, and similar inferences (again, this will be explained later on, when we'll have all building blocks needed for the explanation at our disposal). Another important feature of the account to be proposed is that "strong" free choice permission will be distinguished from standard SDL permission.[5] Following the notation suggested by Hansson, free choice permission between A and B will be written as $Pc(A \vee B)$ while

rights, FCP suggests a solution at least for permissions. Hansson (2013, 209) discusses related phenomena in the domain of commands.

[4] By the substitution of equivalents the substitution of classical logical equivalents will be meant throughout the paper.

[5] Alternatively, one could use a non-truth-functional disjunction.

SDL permission will have its standard notation. Only disjunctive non-modal formulas can occur within the scope of free choice permission, and it will be impossible to derive a free choice permission from formulas that have no occurrence of free choice permissions (in other words, free choice permissions will occur as premises rather than consequences).

The structure of the paper is as follows. First, I will recapitulate reasons why SDL should not be enriched with FCP as it stands (Section 2). Second, I will consider some approaches known in the literature and formulate some objections against them (Section 3). I will argue that FCP should be treated as a defeasible principle: it can be fruitfully employed, but its use can be also reasonably cancelled (Section 4). Subsequently, I will explain the connection between defeasibility and non-monotonic logics very briefly (Section 5). Finally, I will introduce and defend FCP as a default rule, showing how implausible results can be avoided and defeasibility maintained employing adaptive logics (Section 6) and conclude the paper (Section 7).

2. FCP meets SDL: implausible consequences

As Hansson (2013, 207) puts it, although the free choice postulate "seems innocuous when presented in connection with a permitted choice, in combination with other deontic postulates it gives rise to a whole series of implausible results". Hansson discusses some of them (see Hansson 2013, 207-208):

(IR1) $OA \rightarrow O(A \wedge B)$
(IR2) $OA \rightarrow PB$
(IR3) $PA \rightarrow PB$
(IR4) $PA \rightarrow P(A \wedge B)$

The derivation of IR1 requires the substitution of equivalents and interdefinability ($OA \leftrightarrow \neg P \neg A$). IR2 requires the substitution of equivalents, $OA \rightarrow PA$ and $OA \rightarrow O(A \vee B)$. IR3 requires $O(A \wedge B) \rightarrow OA$ and interdefinability. IR4 has been derived using only FCP and the substitution of equivalents. Another problematic inference concerning FCP is the Hansson's (2013, 218) *Vegetarian's Free Lunch*, which goes as follows: "You may

have a meal with meat or a meal without meat. Therefore you may either have a meal and pay for it or have a meal and not pay for it."

Should we abandon the principle, as numerous implausible consequences suggest? Should we wave goodbye to SDL and accept the principle as an infallible logical rule, as the intuitive plausibility of the principle suggests? Is there a middle way between these two extremes? Or should we abandon semantics and divert to pragmatics?

3. FCP: state of art

Let us first have a look at the approaches present in the literature. Hansson (2013, 209-218) lists five main types of proposed solutions to the problem of free choice permission, which can be divided into two categories, semantic and pragmatic. Hansson claims that the second approach is pragmatic and the rest belongs to the semantic category.

The first approach, the *mistranslation of or*, claims that the problem of free choice permission arises due to a mistranslation of *or* from some natural language into some logical language. When we say "You may A or B", this *or* is not a truth-functional disjunction, but a connective for contracted sentence parts. The above sentence is a contraction for *You may A and you may B* (so-called dummy connective approach). We should thus represent it as $PA \wedge PB$, rather than as $P(A \vee B)$. However, this leaves at least one question open: which part of $PA \wedge PB$ corresponds to "or"? It is not transparent how we acquired this formalization. Alternatively, we should represent it as $(\forall x)(x=A \vee x=B \rightarrow Px)$, what is equivalent to $PA \wedge PB$ (so-called checklist conditional approach). This is the approach advocated by Makinson (1984).

The second main approach goes by the name *conversational implicature* and it suggests that free choice effect is not inherent in the language, but implied by the context of utterance, thereby being a pragmatic, rather than semantic phenomenon. The Gricean mechanism is thus invoked to explain the free choice effect. The predominant pragmatic view is to understand free choice inferences as a sub-species of scalar implicatures (see Kratzer & Shimoyama 2002; Chemla 2009; Singh et al. 2016, among others). Interestingly, Kratzer & Shimoyama (2002) consider the free choice inference as an implicature *because* of its cancellability.

The third approach can be entitled *a hidden operator approach*. This approach understands *or* as ambiguous between truth-functional disjunction and a connective including *and you may choose which*. Free choice effect is thus inherent in one of the meanings of *or*. Alternatively, free choice effect can be inherent in the syntactic structure (surely not in the surface structure, but possibly in the logical form of the sentence). Such an account has been called syntax-based. Hans Kamp (1973) takes this route.

The fourth approach on Hansson's list is called *free choice operators*. Hansson explains that according to this approach, "[t]he 'or' of free choice permission follows other logical laws than those of ordinary permission" (Hansson 2013, 210). This claim is a bit misleading, since what is proposed here is not specific disjunction, but specific permission.

The fifth, Hansson's own approach, *the impossibility of single-sentence representation*, claims that free choice permission is a property of the sets of action describing sentences, rather than a property of disjunction of these sentences. In "You may A or B", free choice permission is understood as a property of the set {A, B}. Yet, as Hansson (2001, 131) notes, the Makinson's (1984) checklist conditional approach satisfies this criterion too. For this reason, it is not clear why is it listed as a different solution.

A hyperintensional approach was suggested by Zimmermann (2000) and also by Anglberger, Faroldi and Korbmacher (2016). Unfortunately, hyperintensional approach is not mentioned in Hansson's list of proposed solutions. The approach is closely related to mistranslation of 'or', yet it cannot be subsumed under this category as specified by Hansson. It is also related to the fifth approach. Anglberger, Faroldi and Korbmacher propose the exact truth-maker semantics, which makes the free choice principle valid. Zimmermann proposes that a disjunctive permission should be analysed in terms of a special, non-Boolean disjunction (disjunction as a conjunctive list of epistemic possibilities). His approach has another distinctive feature: while the previous proposals were trying hard to validate the free choice postulate (what was, after all, the original goal), Zimmermann denies that the free choice postulate is valid. Rather, he claims that free choice effect *does not always come about*, though it sometimes does. In particular, free choice effect arises when the speaker is an authority on issue in question. For any context c and property P the speaker is an authority on P in c iff the speaker knows P's extension in c. Zimmermann gives us some examples of such authorities, be it a legal advisor or someone who

has just read the book of rules. Extreme examples are performative uses (saying so makes it so), e.g. a father giving a permission to his child. Zimmermann presents us also with his peculiar solution to the challenge of defeasibility:

> Obviously, cancellations of the choice effect are no problem for the present approach. Indeed, by uttering a sentence like [Mr. X may take a bus or taxi, but I don't know which] the speaker explicitly reveals that she is not an authority – if not remembering is taken as indication of a lack of knowledge. (Zimmermann 2000, 287)

On the contrary, the approach suggested by Anglberger, Faroldi and Korbmacher has no place for cancellations or situations where the free choice effect does not come about. This is so because the free choice permission is incorporated straight into the proposed semantics. Hyperintensional approach completes the list of main proposals, yet for sure, not all of existing proposals could be outlined here.

Let me now assess the presented approaches and point to some of their drawbacks. The main problem I see with the first approach is closely related to the very motivation for the solution which will be suggested in this paper. The issue is that if "You may A or B" is unambiguously translated into a logical formulation equivalent to "You may A and you may B", no weakening and no defeating of the free choice effect is possible. Yet as the next section argues, there are such cases of weakening or defeating of the free choice effect. Also, as shortly indicated above, the first version of this approach leaves no clues *why* we tend to use *or* instead of *and*, if *and* is what we originally meant. Neither is it clear what part of the formulation corresponds to the original *or*. In contrast, the checklist conditional approach suggests an elegant and transparent formulation: not only is disjunction preserved, it is also clear how it leads us to a conjunctive meaning. A disadvantage is that we have to leave the propositional language, which is so commonly used in deontic logic. This may be seen as a too high price to pay, given that the only gain is the apparent transparency of the free choice disjunction.

The second approach locates free choice permission in the realm of pragmatics. Importantly, it allows us to *derive* the free choice effect, and to subsequently *defeat* the very same effect. One trouble with the so-called

scalar implicature view is that the account of free choice inference requires distribution over disjunction, while there are free choice inferences related to abilities, but distribution over disjunction $\Diamond(A \vee B) \rightarrow \Diamond A \vee \Diamond B$ is not generally valid for them (see Nouwen 2018). Moreover some recent findings suggest that there are considerable differences between scalar implicatures and free choice inferences (see Chemla & Bott 2014, Tieu et al. 2016). As Willer (2017) rightly notes, this is, however, not a sufficient evidence for showing that the phenomenon is not pragmatic. Now a question whether the phenomenon should be addressed by semantics or by pragmatics is a serious question for philosophy.[6] Yet the present question (for the logician) is rather how to capture these derivations and cancellations *in logic*. This is something the pragmatic solution leaves open (or worse, it leaves us with the literal meaning, the original unhelpful and implausible SDL formalization of "You may A or B" as $P(A \vee B)$). My reply to the semantic/pragmatic localization of the phenomenon is as follows: while there are tests for finding out whether some phenomenon is semantic or pragmatic, they seem to be inconclusive. Moreover, even some empirical data go against the implicature view: if the free choice inference was a scalar implicature, the restricted time would result in a decreased rate of free choice responses. However, this hypothesis was falsified (Chemla & Bott 2014). This result corresponds to the linguistic intuition that we in fact don't execute complicated inferences to derive the free choice effect. This evidence gives us some reasons to deny that free choice is a pragmatic phenomenon. But more importantly, and in line with Willer (2017), *whether the phenomenon is semantic or pragmatic, the logician may suggest a logic for this phenomenon*. If the phenomenon is semantic, s/he might claim that the suggested logic captures *the literal meaning* of the free choice permission. If the phenomenon is pragmatic, s/he might claim that the suggested logic captures *the communicated meaning*, or the implied content, or utterances containing free choice permission. Importantly, implicatures in general can be rather smoothly analysed as default rules, for their cancellability is an acknowledged phenomenon. In other words, even if the phenomenon was pragmatic, the solution I am about to offer is a natural choice.

Hidden operator approach postulates lexical or syntactic ambiguity. Disjunctive permission is thus once analysed in the free-choice manner,

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6 Thanks to one of the *Organon F* reviewers for pressing me to address this issue.

once in the classical manner (i.e. without the free choice effect). One problem is, however, how to delineate cases with free choice reading from cases without it. A similar worry as the one related to the first approach applies here: If we disambiguate a sentence as having the free choice reading, the free choice effect cannot be subsequently cancelled.

As regards the fourth approach, various operators for the free choice permission lead to various implausible results (see Hansson 2013, 214-217). All of such solutions share a common assumption, which Hansson believes to be the root of inadequacy of such approaches, namely, the single sentence assumption: "Free choice between *a* and *b* can be represented as a property of a single sentence, namely $a \vee b$" (Hansson 2013, 218). Hansson claims that this assumption leads to a troubling consequence: If $a \vee b$ and $c \vee d$ are equivalent, then there is a free choice permission between *a* and *b* iff there is a free choice permission between *c* and *d*. This leads to absurd consequences, such as the Vegetarian Free Lunch example (recall: you have a meal with meat or without meat; therefore you may either have a meal and pay for it or have a meal and not pay for it).

Hansson is surely right that this is absurd. Yet, is he really right that the trouble is a consequence of the single sentence assumption? There is an alternative that free choice permission in fact creates (hyper)intensional context, and does not allow for unrestricted use of the extensionality principle.

Hansson does not seem to take this possibility into account and suggests that free choice permission should be represented as a property of the set of action-describing sentences, because

> (free choice) permission to perform either *a* or *b* is not a function of a single sentence $a \vee b$ but a function of the two sentences *a* and *b*. It is a function of two variables, not one. Similarly, (free choice) permission to perform *a*, *b*, or *c* is a function of three variables, etc. (Hansson 2013, 218)

Unfortunately, he does not present us with much details of his account, just with the main idea.

Zimmermann claims that cancellations of the choice effect are no problem for his approach. His explanation of the occasionally fading free choice effect seems to have some rationale. Yet this explanation is not satisfactory

enough: Zimmermann admits that free choice effect is sometimes cancelled, but this would be possible only if the free choice effect *would have been originally present*: by some utterance, we are cancelling something what was previously uttered or implied by our utterance. However, in Zimmermann's account the very notion of cancellation is not applicable. Cancellations are thus a problem for this approach. The proposal of Anglberger, Faroldi and Korbmacher validates the free choice principle and thereby inherits the main disadvantage of the first approach: free choice effect is present whenever a disjunctive permission is, and cannot be cancelled.

4. FCP and defeasibility

As indicated, if the pragmatic approach is right, free choice effect should be defeasible. Indeed, this seems to be acknowledged as an obvious fact in this vein of literature (see for instance Tieu et al. 2016, Kratzer & Shimoyama 2002). Semantic approaches seem to count with this phenomenon too (see Zimmermann 2000, Anglberger, Gratzl & Roy 2015).

Let us consider some examples where the free choice effect is weakened or defeated. Hans Kamp's thoughts contain one such example, when he wanted to utter (BC), leading to the free choice effect, but uttered (B) instead (see Section 1). Alternatively, one can adjust the original example in the following way (three dots stand for Kamp's contemplative moment):

(7) *You may go to the beach or go to the cinema. ...But first ask your mother.*

(8) *You may go to the beach or go to the cinema. ...But you don't have enough money for a cinema ticket and I won't give you any.*

(9) *You may go to the beach or go to the cinema. ...But I don't know which one.*

(10) *You may go to the beach or go to the cinema. ...But there are sharks in the ocean, don't go to the beach.*

(11) *You may go to the beach or go to the cinema. ...But the cinema is under the reconstruction. It is closed this month.*

(12) *You may go to the beach or go to the cinema. ...But not only to the closest cinema to our house.*

(13) *You may go to the beach or go to the cinema. ...But don't leave the town!*

Different kinds of defeasibility occur in (7)–(13). In (7), the father in question is not the sole normative authority (this phenomenon was discussed also by Zimmermann 2000) and though his permission is granted, permission from someone else (e.g., the child's mother) is needed before exercising disjunctive permission from (7). In (8), disjunctive permission is granted, but the practical possibility of realisation of one "option" is questioned. How could (9) possibly happen? One such scenario would be the following: The father is no normative authority in this respect, but he still remembers some permission has been given by someone else (e.g., the child's mother again). This example is different from others at least in two respects: first, epistemic modality is intertwined with deontic modality; second, while the first sentence has the same form as in other examples (i.e. it is a disjunctive permission), it is indicated that the free choice effect was not present at all: the father doesn't know *which* one. This suggests that *only one* of those two actions has been permitted (admittedly, by someone else), but the father doesn't remember which one. (How would theories which suggest that "or" is just mistranslated into the logical language as disjunction, whilst the real meaning is conjunctive, reply to this sort of examples?)[7] In (10), free choice is defeated, though it surely was present at the time of uttering of the sentence expressing disjunctive permission. In (11), both options are granted, but as in (8) the practical possibility of realisation of one option has been challenged, here the practical impossibility of such realisation is suggested. In (12) and (13), restrictions are imposed upon the admissible ways of realizing the permission in question. These may lead to cancellations too: e.g., imagine a situation where there's no cinema in the town, or where the nearest cinema is closed or too expensive.

[7] As one of the reviewers pointed out, it can be claimed that (9) is not even a free choice permission situation. Yet if we imagined it uttered in some dialogue, after uttering, the addressee would understand it as free choice permission. It is only after the latter sentence that this prescriptive *and* free choice reading would be shown implausible, and thus, in a sense, defeated.

Interestingly, free choice inferences can be even more dynamic: free choice effect can appear, disappear, reappear… Consider the following dialogue:

Father: *You may go to the beach or to the cinema.*
Father: *But don't leave the town!*
Son: *But the cinema in our town is closed.*
Father: *Go to the beach then.*
Son: *I was there yesterday.*
Father: *Ok, you may leave the town.*
Father: *But first, ask your mother!*

The free choice effect has appeared in the first replica, disappeared in the subsequent communication, and reappeared by the allowance to leave the town, started to fade out again by the father not being the sole authority in the present case.

For sure, Hansson's phenomenon of defeasibility is not restricted to disjunctive permissions. Of course, almost anything can be defeated in the flow of communication, not only the free choice effect. But there is one important feature pertaining to disjunctive permissions: one can defeat or weaken just one conjunct of the consequent of FCP after stating only its antecedent. This means that the free choice effect itself is defeated or weakened. Also, defeasibility may occur in the connection to various rules and phenomena within deontic logic and normative reasoning (cf. for instance the paper Mullins 2016 claiming that rights should be treated in terms of default logic, or motivations for introducing any non-monotonic deontic logic, since, as it will be explained shortly, the two are closely related). However, what concerns me is solely the free choice principle, and how we should treat it. My suggestion is that it is indeed a very useful and plausible principle, but some care should be taken, and it should be accepted only as a default rule, not as an infallible principle. What is also clear is that SDL and similar normal modal logics are static and monotonic: what was once permitted stays permitted. In other words, the addition of new information cannot defeat the previous consequences of a (normative) system. We thus need some deontic logic that is not static and monotonic.

5. Defeasibility and non-monotonic logics

The problem of defeasibility is being almost uniformly solved with the help of non-monotonic logics. Let me explain this a bit. On the one hand, classical logic is monotonic: suppose we have some premise set $\Pi_1 = \{p_1,...,p_n\}$ and $c \in Cn(\Pi_1)$ (i.e. c is a logical consequence of Π_1). Now imagine that we gain further information p_{n+1}, so we add it to our "knowledge base", thus creating the premise set $\Pi_2 = \{p_1,...,p_n, p_{n+1}\}$. Obviously, $\Pi_1 \subseteq \Pi_2$ holds and so $Cn(\Pi_1) \subseteq Cn(\Pi_2)$ holds classically too. It is thus impossible that $c \notin Cn(\Pi_2)$.

Monotonic logic is entirely satisfactory if we want to derive consequences of complete, static and consistent information about some domain. However, this is usually not the case in this world of imperfectness. The field of artificial intelligence aims to deal with reasoning from incomplete or inconsistent knowledge bases, and because of this, non-monotonic reasoning is widely studied in the field. Formally, operator of logical consequence *Cn* is non-monotonic, if for some sets Π_1, Π_2 such that $\Pi_1 \subseteq \Pi_2$ it holds that $Cn(\Pi_1) \not\subseteq Cn(\Pi_2)$. So our set $Cn(\Pi_2)$ can possibly miss *c*.

Non-monotonicity is a fundamental feature of default reasoning. The most influential paper in the field is surely Reiter's 1980 paper *A Logic for Default Reasoning*. As Reiter explains, despite the fact that we do not have total knowledge about some domain, we must sometimes draw conclusions based on our incomplete information. Default reasoning arises on this ground and it amounts to an inference of the following form: in the absence of any information to the contrary, assume...

Deontic extensions of logics for default reasoning have been introduced mainly because of the obvious existence of so-called normative conflicts in natural language (a normative conflict obtain when $O\varphi \wedge O\neg\varphi$ holds for some φ). While normative conflicts are quite common in natural language, they make standard deontic logicians feel uneasy. First of all, an occurrence of normative conflict in SDL leads to inconsistency. Furthermore, it leads to so-called deontic explosion. Another troublesome consequence is Chisholm's famous paradox. All these worries motivated deontic logicians to devise non-monotonic deontic logics (see Lou Goble's chapter on normative conflicts as evidence – Goble 2013a). A non-monotonic approach allows us to retain most of the standard principles and still avoid the most troublesome consequences.

As suggested above, I believe that situation with the free choice problem is similar in this respect to the situation with normative conflicts. On the one hand, we have plausible principles of standard deontic logics. On the other hand, we have the troublesome (but still plausible) free-choice principle, which is incompatible with these principles and which can be defeated.

6. FCP meets non-monotonic logic

Following Reiter's pioneering 1980 work, one can reformulate FCP in natural language as follows:

(FCP*) If it is permitted that φ or ψ, then it is *usually* permitted that φ and permitted that ψ.

It has to be specified in advance what is understood by a disastrous consequence (contradiction is the prime example of a disastrous consequence, normative conflicts can be listed as another example – what else?). Consequently, any use of FCP* that leads to a disaster will be cancelled. FCP* will be at hand anytime, helping us to generate consequences, but non-monotonicity will help us to avoid logical disasters.

Now various non-monotonic deontic logics can be used. For the present purposes it matters little whether one opts for Horty's default logic (Horty 1993; 1997), or for adaptive logics, or for some other framework. I will use adaptive logics as the framework for treating free choice permissions. As we will see very soon, this choice can be motivated by similarities between dynamic character of the proof theory of adaptive logics and dynamic character of free choice inferences.

Adaptive logic is an interesting framework for default reasoning, developed mainly by Diderik Batens (see Batens 2007, Batens & Haesaert 2002, Goble 2013a and 2013b). In general, an adaptive logic *AL* is a triple ⟨*LLL*, *Ω*, *Strategy*⟩. *LLL* is so-called lower limit logic, which is reflexive, transitive, monotonic, compact, has characteristic semantics and contains classical logic. *Ω* is a set of abnormalities, which is *LLL*-contingent (neither abnormalities nor their formal negations are theorems of *LLL*) and contains at least one logical symbol. *Strategy* is a method how to evaluate proofs

where 'abnormal' consequences have been derived. Most widely used strategies are *reliability strategy* and *minimal abnormality strategy*. The proof theory of adaptive logics consists of three generic rules, namely

> a simple rule of premise introduction, PREM, and a rule RU that accepts unconditionally all inferences valid in LLL. And then the conditional or provisional rule RC that is characteristic of adaptive logics. (Goble 2013b, 9)

The key idea behind the proof theory of adaptive logic is *marking*. Some lines of proofs are marked, some are not. If a line is marked, formula occurring on it is no longer derivable. Yet, the very notion of derivability is unstable as "marks may come and go" (Batens 2007, 8).

Adaptive logics have their deontic versions (see Beirlaen, Meheus & Straßer 2013, Goble 2013a, 2013b, Van De Putte, Beirlaen & Meheus 2018). As already stated, an adaptive logic *AL* is a triple $\langle LLL, \Omega, Strategy \rangle$, where *LLL* is so-called lower limit logic, Ω is a set of abnormalities, and *Strategy* deals with problems, for instance, with inconsistencies. Nothing precludes the use of some deontic logic as *LLL*, if it is a reflexive, transitive, monotonic and compact logic, which has characteristic semantics and contains classical logic. For instance, we can use deontic extensions of classical propositional logic, such as SDL. Since adaptive deontic logics are used mostly to account for normative conflicts, their crucial aim is to avoid any form of deontic explosion and to account for some intuitive arguments that are usually problematic for deontic logics for normative conflicts. Though this is not the aim of the present paper, some inspiration can be drawn from the way in which are these systems introduced:

> In general, adaptive logics are a type of dynamic, non-monotonic system of reasoning designed to apply problematic rules, such as aggregation or distribution, provisionally. A use of the rule is accepted until it makes trouble, as gauged against a specified class of abnormalities, at which point, but only at that point in context, it is rejected. (Goble 2013a, 338)

What potentially problematic rules come into play in our case? Surely, the free choice postulate is such a rule.

The adaptive logic employed will be entitled $SDL_c^m = \langle SDL_c, \Omega_c, m\rangle$ (following the notation from Van De Putte, Beirlaen & Meheus 2018). SDL_c is *SDL* with a dummy operator *Pc* for free choice permission. As the *prima facie* obligation in the work quoted, free choice permissions cannot be derived from other free choice permissions. One constraint is that we allow only disjunctive formulas to be in the scope of *Pc*. Ω_c is specified by the logical forms $Pc(A \vee B) \wedge \neg PA$ and $Pc(A \vee B) \wedge \neg PB$; m stands for the strategy employed: minimal abnormality. It needs to be said that minimal abnormality is not the simplest strategy available and its precise definition is rather complex. However, as we will see later on, it has some advantages over the simpler reliability strategy. Informally, "we have sufficient reasons to infer A [if] every minimally abnormal way of interpreting the current proof stage will make A true" (see Van De Putte, Beirlaen & Meheus 2018, section 3).

To capture defeasibility of the free choice effect of disjunctive permission in terms of adaptive logic, rules of the type RC are at our disposal. In our case: From the free choice permission $Pc(A \vee B)$ infer PA (PB), under the constraint that none of the abnormalities in $\{Pc(A \vee B) \wedge \neg PA, Pc(A \vee B) \wedge \neg PB\}$ be derivable from Γ:

> If $Pc(A \vee B) \vdash_{LLL} PA \vee (Pc(A \vee B) \wedge \neg PA)$, then $Pc(A \vee B)$ implies PA unless $Pc(A \vee B) \wedge \neg PA$ is derivable.
> If $Pc(A \vee B) \vdash_{LLL} PB \vee (Pc(A \vee B) \wedge \neg PB)$, then $Pc(A \vee B)$ implies PB unless $Pc(A \vee B) \wedge \neg PB$ is derivable.

To demonstrate that these rules work as expected, let me start with constructing a proof of PA and PB from the premise $Pc(A \vee B)$ (to establish the validity of the formal representation of the free choice postulate in an adaptive logic):

1. $Pc(A \vee B)$	-	PREM	Ø
2. $PA \vee (Pc(A \vee B) \wedge \neg PA)$	1	RU	Ø
3. PA	1,2	RC	$\{Pc(A \vee B) \wedge \neg PA\}$
4. $PB \vee (Pc(A \vee B) \wedge \neg PB)$	1	RU	Ø
5. PB	1,4	RC	$\{Pc(A \vee B) \wedge \neg PB\}$

To show that defeasibility really works here, it is needed to add information $\neg PA$ as a premise (or to derive it):

6. $\neg PA$	-	PREM	Ø
7. $Pc(A \vee B) \wedge \neg PA$	1,6	RU	Ø

Since the formula of line 6 is so-called minimal Dab-formula that is derived on an empty condition, any line with this formula in conditions is to be marked. Because of this, the line 2 is to be marked (✓ is standardly written in front of the marked lines).

Can we go on with and defeat also PB? Having a different notation for free choice permission and for standard permission, we can do it without deriving contradiction. Yet if we wished to weaken this ability of defeating (i.e., quite plausibly claiming that $Pc(A \vee B)$ is inconsistent with having both $\neg PA$ and $\neg PB$), we can add an unconditional rule $Pc(A \vee B) \rightarrow PA \vee PB$. Be it as it may, the free choice effect can be easily cancelled within this framework, without thereby having a contradiction in the system.

Let me now motivate the employed strategy shortly. Inferring the free choice effect is consistent with adding "but not both". For instance, we might be told in a hotel restaurant that "You may have a cake or an ice cream as a dessert". Now sadly for a greedy person, "but not both" reading is usually assumed. An alternative reliability strategy would not allow us to have $PA \vee PB$ derived from the free choice permission $Pc(A \vee B)$ if $\neg PA \vee \neg PB$ (i.e., "but not both") is assumed. Consider the following proof:

1. $Pc(A \vee B)$	-	PREM	Ø
2. $PA \vee (Pc(A \vee B) \wedge \neg PA)$	1	RU	Ø
3. PA	1,2	RC	$\{Pc(A \vee B) \wedge \neg PA\}$
4. $PB \vee (Pc(A \vee B) \wedge \neg PB)$	1	RU	Ø
5. PB	1,4	RC	$\{Pc(A \vee B) \wedge \neg PB\}$
6. $PA \vee PB$	3	RU	$\{Pc(A \vee B) \wedge \neg PA\}$
7. $PA \vee PB$	5	RU	$\{Pc(A \vee B) \wedge \neg PB\}$
8. $\neg PA \vee \neg PB$	-	PREM	Ø
9. $(Pc(A \vee B) \wedge \neg PA) \vee (Pc(A \vee B) \wedge \neg PB)$	1,8	RU	Ø

Now reliability strategy has it that (Van De Putte, Beirlaen & Meheus 2018, Section 3) "a line is marked whenever its condition contains an abnormality that is a disjunct of a minimal Dab-formula that has been derived in the same proof." A minimal Dab-formula is contained in the line 9. This means

that according to the reliability strategy, lines 3, 5, 6 and 7 are marked as unreliable. However, this is not plausible: we want to keep the possibility to have at least some dessert! In other words, $PA \vee PB$ should be derived. Minimal abnormality allows us to have this result. Every minimally abnormal way of interpreting the current proof stage suggests that just one of the two abnormalities in question holds (either $Pc(A \vee B) \wedge \neg PA$ or $Pc(A \vee B) \wedge \neg PB$). But whichever of them holds, we can derive $PA \vee PB$, and because of this, this formula is derived (and we will have our dessert).

Finally, let us have a look on implausible results mentioned in Section 2 and see whether their derivation can be blocked within the present proposal. Note that what will block implausible results is not the non-monotonic logic, but the very fact that there are two kinds of permission: free choice permission of the form $Pc(A \vee B)$ which is given rather as an input than as an output, and Pφ of SDL. Because of this, I will leave derivations (with little amendments) as they were shown in Hansson (2013), and explain which of their steps will fail under the present proposal (strictly speaking, any line with free choice principle will fail, as it is not an axiom in the adaptive logic).

Derivation of (IR1) $OA \rightarrow O(A \wedge B)$,

1. $P(\neg A \vee \neg B) \rightarrow P\neg A$
2. $P\neg(A \wedge B) \rightarrow P\neg A$
3. $\neg P\neg A \rightarrow \neg P\neg(A \wedge B)$
4. $OA \rightarrow O(A \wedge B)$

is based on the equivalence between $P(\neg A \vee \neg B)$ and $P\neg(A \wedge B)$. This equivalence still holds under the present proposal, but $P(\neg A \vee \neg B)$ is clearly not a free choice permission, so the first line cannot be derived. On the other hand, if there were $Pc(\neg A \vee \neg B) \rightarrow P\neg$A in the first line, the equivalence with $P\neg(A \wedge B)$ cannot be assumed.

Derivation of (IR2) $OA \rightarrow PB$,

1. $P(A \vee B) \rightarrow PB$
2. $O(A \vee B) \rightarrow P(A \vee B)$
3. $O(A \vee B) \rightarrow PB$
4. $OA \rightarrow O(A \vee B)$
5. $OA \rightarrow PB$

is based on non-free choice disjunctive obligation seen as implying the free choice disjunctive permission. Again, while $O(A \vee B) \rightarrow P(A \vee B)$ holds, $O(A \vee B) \rightarrow Pc(A \vee B)$ does not. If we added "free choice obligations" into the language, the principle $Oc(A \vee B) \rightarrow Pc(A \vee B)$ would be correct. However, $OA \rightarrow Oc(A \vee B)$ would fail, as we cannot introduce the choice between obligations of A and B from the obligation of A.

Derivation of (IR3) $PA \rightarrow PB$,

1. $O(\neg A \wedge \neg B) \rightarrow O\neg A$
2. $O\neg(A \vee B) \rightarrow O\neg A$
3. $\neg O\neg A \rightarrow \neg O\neg(A \vee B)$
4. $PA \rightarrow P(A \vee B)$
5. $P(A \vee B) \rightarrow PB$
6. $PA \rightarrow PB$

again rests upon the conflation of two kinds of permission. The line 4 cannot be derived with free choice permission, which is, however, needed to derive (something similar to) the line 5.

Derivation of (IR4) $\rightarrow P(A \wedge B)$,

1. $P((A \wedge B) \vee (A \wedge \neg B)) \rightarrow P(A \wedge B) \wedge P(A \wedge \neg B)$
2. $PA \rightarrow P(A \wedge B) \wedge P(A \wedge \neg B)$
3. $PA \rightarrow P(A \wedge B)$

rests upon the extensionality of free choice permission, which, however, fails for this kind of permission. Another important thing is related to the free choice principle figuring as a rule rather that as an axiom. Even if one opted for adaptive logics with the free choice permission obeying the extensionality principle, thereby being able to substitute PA for $P((A \wedge B) \vee (A \wedge \neg B))$ in $P((A \wedge B) \vee (A \wedge \neg B)) \rightarrow P(A \wedge B) \wedge P(A \wedge \neg B)$, one would not be able to list the free choice principle in the first line: $P((A \wedge B) \vee (A \wedge \neg B))$ would have to be listed as a premise first, (provisionally) granting the permission of both A with B and A with $\neg B$. Under this supposition, the conclusion would be much less controversial (cf. also the open reading of permissions in Anglberger, Gratzl & Roy 2015).

7. Conclusion

The main topic of the present paper is disjunctive permission and its free choice effect. As is well-known, the addition of so-called free choice principle into SDL results in many troubles. Yet the principle itself seems to be very plausible and useful. Because of this "dilemma", the paper opted for a middle way: to accept the principle, but only as a default rule. This suggestion was further motivated by several examples of how the free choice effect can be easily defeated in the subsequent communication, but also by discussing and evaluating accounts formulated in the literature. After that, the paper explained that the phenomenon of defeasibility in natural language is standardly being solved in terms of non-monotonic logic. Finally, the paper defined an adaptive deontic logic SDL_c^m and showed how free choice effect can be derived and cancelled within this logic, and how implausible consequences can be avoided.

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