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On the Logical Form of Concessive Conditionals

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Abstract
This paper outlines an account of concessive conditionals that rests on two main ideas. One is that the logical form of a sentence as used in a given context is determined by the content expressed by the sentence in that context. The other is that a coherent distinction can be drawn between a reading of 'if' according to which a conditional is true when its consequent holds on the supposition that its antecedent holds, and a stronger reading according to which a conditional is true when its antecedent supports its consequent. As we will suggest, the logical form of concessive conditionals can be elucidated by relying on this distinction.

Keywords Concessive · Conditional · Even if · Evidential · Logical form · Support

1 Some Distinctive Features of Concessive Conditionals

Concessive conditionals — *concessives* for short — have always been a conundrum for theorists of conditionals. Although they behave like ordinary conditionals in many respects, they exhibit distinctive logical features that can hardly be explained by simply applying one's favoured analysis of 'if'. These features are naturally associated with the word 'even', which typically occurs in concessives. For example, imagine that the two sentences below are uttered in a situation in which Glen intends to go out for a walk and hopes for a sunny day:

(1) If the weather is good, Glen will go out
(2) Even if the weather is not good, Glen will go out

In this case (2) is a concessive. What it says is that a bad weather will not affect Glen's plan, that is, Glen is determined to go out anyway.

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In order to spell out the difference between (1) and (2), we will list some observations about concessives that we take to be relatively uncontroversial. We will use the the notation $p \hookrightarrow q$ to indicate a concessive with antecedent p and consequent q, and reserve the generic label 'nonconcessives' for ordinary indicative conditionals. This is not to suggest that nonconcessives form a homogeneous class from the logical point of view. As it will turn out, our account of concessives does not depend on a specific view of nonconcessives, and is consistent with the possibility that different readings of 'if' are equally admissible.

Observation 1 $p \hookrightarrow q$ seems to imply that q holds no matter whether p holds. That is, from $p \hookrightarrow q$ one can reasonably infer 'Whether or not p, q'. For example, (2) conveys the claim that Glen will go out no matter whether the weather is good. By contrast, (1) does not convey this claim, for it leaves unspecified what Glen will do in case of bad weather. This is widely regarded as a key difference between concessives and nonconcessives. Note that, insofar as 'Whether or not p, q' is paraphrased as 'If p, then q, and if $\neg p$, then q', as is plausible to expect, this observation suggests that $p \hookrightarrow q$ entails q.[1]

Observation 2 As long as q is not necessary, $p \hookrightarrow q$ seems to imply that p does not support q, where 'p supports q' means that p provides a reason for accepting q, or that the inference from p to q is justified. The case in which q is necessary can be left out here because intuitions about support are less clear when necessary consequents are involved. The best way to appreciate the plausibility of this observation is to realize that concessives cannot be paraphrased by adopting terms that explicitly indicate support. For example, it is clearly inappropriate to paraphrase (2) as follows:

(3) If the weather is bad, that is a reason for thinking that Glen will go out
(4) If the weather is bad, one can infer that Glen will go out
(5) If the weather is bad, then as a consequence Glen will go out

By contrast, such a paraphrase is perfectly acceptable in the case of (1):

(6) If the weather is good, that is a reason for thinking that Glen will go out
(7) If the weather is good, then one can infer that Glen will go out
(8) If the weather is good, then as a consequence Glen will go out

According to Gomes, it is a key feature of concessives that they defy this kind of paraphrase, and we agree with him.[2]

Note that, just as $p \hookrightarrow q$ seems to imply that p does not support q, the supposition that p supports q seems to justify the rejection of $p \hookrightarrow q$. This becomes especially clear if one supposes that q logically follows from p, given the uncontentious assumption that logical consequence entails support. Concessives seem to violate Supraclassicality, the principle according to which a conditional holds

[1]The assumption that $p \hookrightarrow q$ entails q is explicitly made in several works, such as Pollock [25], Lycan [21], König [18], Hunter [15], Gomes [12].
[2]Gomes [12], pp. 8-10.

whenever its consequent logically follows from its antecedent: it is not the case that $p \hookrightarrow q$ holds whenever q logically follows from p. For example, it would make little sense to say that even if the weather is not good, it is not good.

Observation 3 $p \hookrightarrow q$ seems to involve some sort of asymmetry between p and $\neg p$, in that the connection between $\neg p$ and q is more natural, or less surprising, than the connection between p and q. (2) suggests that the connection between 'The weather is good' and 'Glen will go out' is more natural, or less surprising, than the connection between 'The weather is not good' and 'Glen will go out'. In this respect, there is a clear sense in which $p \hookrightarrow q$ says something more than 'Whether or not p, q'. While the former entails the latter, as noted above, the converse does not hold.[3]

Observations 1-3 suggest that concessives exhibit logical properties that significantly differ from those of nonconcessives. Obviously, since there is no unique theory of nonconcessives, there is no widespread agreement on their logic. But at least it is relatively uncontentious that the properties just listed do *not* belong to nonconcessives. Most theorists of conditionals would agree that an ordinary indicative conditional does not imply its consequent, that its antecedent can support its consequent, and that the connection between the negation of its antecedent and its consequent need not be more natural, or less surprising, than the connection between its antecedent and its consequent.

At least three further observations about concessives deserve attention. Although these observations are just as plausible as observations 1-3, they will not play a central role in our discussion. The reason is that it is less clear that the properties of concessives they display do not belong to nonconcessives, so it is less clear that they characterize concessives as distinct from nonconcessives.

Observation 4 Concessives seem to obey the following principle: as long as q is not necessary, it is not the case that both $p \hookrightarrow q$ and $\neg p \hookrightarrow q$ hold. Think about our example: it would be weird to say both that even if the weather is bad, Glen will go out, and that even if the weather is not bad, Glen will go out. This principle is a restricted version of the thesis known as Aristotle's Second Thesis, so it may be called Restricted Aristotle's Second Thesis.[4]

Observation 5 Concessives seem to violate Contraposition, that is, it seems that $p \hookrightarrow q$ does not entail $\neg q \hookrightarrow \neg p$. If one utters (2), one is not thereby committed to accept the following conditional:

(9) Even if Glen doesn't go out, the weather will be good

Unlike (2), (9) sounds weird. At least, it sounds weird once we have (2) as information about Glen, as someone who goes out unless the weather is truly terrible. It is

[3]This fact is emphasized in Bennett [3], Vidal [34], Gomes [12], among other works.

[4]Aristotle's Second Thesis has been mainly discussed in the literature on connexive logic, see McCall [23], Estrada Gonzáles and Ramírez-Cámara [10], pp. 346-348.

easier to imagine a situation in which Glen does not go out and the weather is bad rather than one in which Glen does not go out and the weather is good.

Observation 6 A related remark concerns Modus Tollens: the inference from $p \hookrightarrow q$ and $\neg q$ to $\neg p$ appears anomalous. Nobody would reason as follows: even if the weather is bad, Glen is going out; Glen is not going out; therefore, the weather is good. Apparently, the very same intuition that speaks against Contraposition — that p is more likely than $\neg p$, given $\neg q$ — suggests that $\neg p$ is not the right conclusion.[5]

2 Strict Pragmatic Accounts

First we will discuss two main routes that have been pursued to tackle concessives. One is to adopt a strict pragmatic approach and hold that the apparent dissimilarities between concessives and nonconcessives are explainable in terms of assertibility rather than truth. The other is to adopt a strict semantic approach and take these dissimilarities to depend on some difference in meaning between 'if' and 'even if'. As we will show, both routes are hindered by serious troubles.

According to the theorists of conditionals that belong to the first camp, concessives do not differ from nonconcessives from the semantic point of view, because they are exactly alike as far as truth conditions are concerned. For example, (2) and the following conditional say the same thing:

(10) If the weather is not good, Glen will go out

More generally, for every concessive c, there is a nonconcessive $c*$ such that c is true if and only if $c*$ is true. Assuming that a principled distinction can be drawn between what is said and what is implicated, as suggested by Grice, what distinguishes c from $c*$ is that c implicates some additional content. Here the details of the story depend on the favoured analysis of 'if' and on the characterization of the content implicated. But in any case, the moral of the story is that concessives do not require a separate logical treatment.[6]

As far as the analysis of 'if' is concerned, at least two familiar interpretations of conditionals have been adopted in this perspective. One is the *material interpretation*, according to which a conditional is true if and only if its antecedent is false or its consequent is true. Following a line of thought initiated by Grice and developed by Lewis, Jackson, and others, some theorists of conditionals take nonconcessives to be material conditionals, and think that the divergences between the apparent behaviour of nonconcessives and the results predicted by the material interpretation are to be explained as pragmatic effects that concern assertibility rather than truth. It is in line

[5] As Hunter [15] once put it, "concessive conditionals do not fit happily into the schema of Modus Tollens", p. 280. Gomes [12], p. 18, notes that when one utters $p \hookrightarrow q$, one pragmatically excludes the conjunction $\neg p \wedge \neg q$ as impossible.
[6] Grice [14].

with this tradition to say that concessives are nothing but material conditionals from the logical point of view.[7]

The other interpretation, the *suppositional interpretation*, has been developed in different ways by Adams, Stalnaker, and Lewis. Its key idea, which stems from the Ramsey Test, is that to assess a conditional is to ask whether its consequent holds on the supposition that its antecedent holds. The probabilistic version of this interpretation, due to Adams, defines a conditional as acceptable just in case the conditional probability of its consequent given its antecedent is high.[8] Its modal version, due to Stalnaker and Lewis, defines a conditional as true just in case its consequent is true in the closest world, or worlds, in which its antecedent is true. Independently of which version one adopts, one may claim that concessives are nothing but conditionals so understood.[9]

A clear illustration of this attitude is provided by the following quote from Stalnaker:

> Consider the following case: you firmly believe that the use of nuclear weapons by the United States in this war is inevitable because of the arrogance of power, the bellicosity of our president, rising pressure from congressional hawks, or other *domestic* causes. You have no opinion about future Chinese actions, but you do not think they will make much difference one way or another to nuclear escalation.[10]

As this passage suggests, Stalnaker would say that the following conditionals are exactly alike from the logical point of view:

(11) If the Chinese do not enter the conflict, the United States will use nuclear weapons

(12) Even if the Chinese do not enter the conflict, the United States will use nuclear weapons

If there is a difference between (12) and (11), it is a pragmatic difference.

The main problem with strict pragmatic accounts is that they seem unable to provide a sufficiently detailed explanation of the logical behaviour of concessives. Consider the material interpretation. If concessives are material conditionals, then some pragmatic story is needed to explain observations 1-3, given that none of the properties involved holds for material conditionals. The case of the suppositional interpretation is similar, for suppositional conditionals do not differ from material conditionals as far as observations 1-3 are concerned. In both cases it has to be explained why concessives manifest exactly these properties rather than others. As far as we know, no such explanation has ever been provided.

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[7] Grice [14], Lewis [20], Jackson [17]. A recent work that defends the material interpretation is Williamson [36].

[8] Adams [1] initially defined assertibility conditions for conditionals, then Adams [2] switched from assertibility to acceptability in order to avoid reference to pragmatics.

[9] This is the idea developed in Stalnaker [33] and Lewis [19], although according to the latter it applies to counterfactuals and not to indicative conditionals.

[10] Stalnaker [33], p. 31.

Perhaps the most elaborate pragmatic account of concessives has been offered by Bennett. According to Bennett, the intuitive difference between a concessive c and the corresponding nonconcessive $c*$ is explainable in terms of c's assertibility conditions, which are defined as follows: there is a salient "neighbour" conditional c' believed by speaker and hearer, c' and $c*$ are naturally seen as parts of a single more general truth, and the truth of c' is less surprising or striking or noteworthy than the truth of $c*$. On this view, (2) and (10) have the same truth conditions. But (2), unlike (10), is felicitously asserted in the situation described only if (1) is believed by speaker and hearer, (1) and (10) are naturally seen as parts of a single more general truth, and the truth of (10) is more surprising or striking or noteworthy than the truth of (1).[11]

Bennett's view provides a plausible explanation of observation 3. As long as it is granted that the truth of (1) is less surprising than the truth of (10), it may be argued that there is a clear sense in which 'The weather is good' and 'The weather is not good' are not on a par with respect to (2). But the view does not accommodate equally well observations 1 and 2. As far as observation 1 is concerned, Bennett denies that a concessive entails its consequent. To justify this denial he uses the following example, which concerns a worker whose boss is particularly puritanical:

(13) Even if he drinks just a little, he will be fired

Bennett points out that (13) does not imply that the worker will be fired: surely he can keep his job as long as he does not drink at all.[12]

However, we doubt that this example shows that a concessive does not entail its consequent. Although it is plausible that (13) does not imply that the worker will be fired, it is far from obvious that (13) is a concessive, given that its antecedent seems to support its consequent. This emerges clearly if one thinks that (13) can be paraphrased as follows:

(14) If he drinks just a little, that is a reason for thinking that he will be fired
(15) If he drinks just a little, one can infer that he will be fired
(16) If he drinks just a little, then as a consequence he will be fired

As far as we can see, the mere occurrence of the word 'even' does not suffice to make (13) a concessive, even though its pragmatic effects may be described at least in part along the lines suggested by Bennett.[13]

Here is another example. A party is about to start and everybody knows that the Smiths are such a cheerful family that, whenever they show up, hilarity and amusement are guaranteed. The following sentence is uttered to comment on the possibility that Lisa Smith comes alone, without the rest of the family:

[11] This view has been first proposed in Bennett [3], and then amended in Bennett [4].

[12] Bennett [3], p. 410. This example, attributed to Lewis, is first used in Pollock [25], p. 30.

[13] In particular, 'even' suggests that (13) is less likely, or more surprising, than another conditional that Bennett would call a neighbour, that is, 'If he drank a lot, he would be fired'.

(17) Even if only Lisa comes to the party, it'll be a lot of fun.

Here the contrast marked by 'even' is between the case in which Lisa comes alone and that in which the whole family shows up. In both cases, however, the Smiths' presence is expected to actively contribute to the success of the party, so the antecedent of (17) clearly provides a reason to accept its consequent.

More generally, as Reichenbach, Pizzi, Gomes, and others have noted, there are cases in which the even if' construction is admissible for a conditional in which the antecedent is intended to support the consequent.[14] So, as long as one takes observation 2 to uncover an essential feature of concessives, and agrees that the antecedent of a conditional c is intended to support its consequent, one can hardly classify c as a concessive, no matter whether the word 'even' occurs in c. Conversely, if one wants to claim that c is a concessive, one must deny either that its antecedent is intended to support its consequent, or that the absence of support is an essential feature of concessives.

Bennett's view is silent on observation 2, as it does not explicitly rule out that the antecedent of a concessive supports its consequent. So perhaps he would not be moved by the problem raised above in connection with the alleged counterexamples to observation 1. This silence also concerns Supraclassicality. Although Bennett's formulation of the assertibility conditions of concessives, which hinges on the vague notion of neighbour sentence, leaves room for the possibility that concessives violate Supraclassicality, it provides no definite answer to the question whether Supraclassicality holds for concessives.

Of course, an advocate of the strict pragmatic approach might still contend that the lack of a detailed account of the logical properties of concessives is not really a problem, because there is no such thing as a logic of concessives. After all, it might be claimed that logic concerns what is said, rather than what is implicated. However, one would still need to explain away observations 1-3, which show that there are clearly identifiable regularities in the logical behaviour of concessives. For us, these regularities deserve careful consideration.

3 Strict Semantic Accounts

The theorists of conditionals that belong to the second camp think that the logical behaviour of concessives is explainable in semantic terms: the meaning of a concessive c differs from the meaning of the corresponding nonconcessive $c*$ in virtue of the occurrence in c of the word 'even', which combines with 'if'. For example, what determines the truth conditions of (2), as distinct from the truth conditions of (10), is that (2) contains 'even'. This difference is taken to explain the apparent logical dissimilarities between (2) and (10). In other words, concessives are identified with a type of sentence, so the notation $p \hookrightarrow q$ becomes a schematic representation of the meaning of such sentence.

[14] Reichenbach [27], p. 88, Pizzi [24], p. 82, Gomes [12], p. 10.

We will discuss three accounts along these lines. The first is Pollock's view, according to which $p \hookrightarrow q$ is read as 'q, and p does not raise the possibility of circumstances that rule out q'. Pollock's definition goes as follows: q, and there is no r such that if $p \wedge r$, then $\neg q$, and r might be true if p were true. Here 'if $p \wedge r$, then $\neg q$' is construed as stronger than a material conditional.[15]

This view preserves observation 1 as far as it is assumed that q entails 'Whether or not p, q'. However, it offers no clear explanation of observations 2 and 3. Pollock's definition, at least *prima facie*, does not entail that p fails to support q, and does not rule out that p and $\neg p$ are on a par relative to q.

The second account is Lycan's view, according to which $p \hookrightarrow q$ says that q holds for all events that are taken to be real possibilities for the speaker in the context, including those in which p. Lycan uses the term 'event' as being roughly equivalent to 'case', 'circumstance', or 'situation'.[16]

Just like Pollock's view, this view can handle observation 1, but has troubles with observations 2 and 3. Lycan's definition does not entail that p fails to support q, and it seems to preserve Supraclassicality. Moreover, no clear distinction is drawn between $p \hookrightarrow q$ and 'Whether or not p, q', because if the former holds, hence q holds in every event, both the cases in which p and those in which $\neg p$ are included in the class of cases in which q holds.[17]

The third account, due to Vidal, provides a compositional semantics for 'even if' based on distinct modular treatments of 'even' and 'if'. According to Vidal, $p \hookrightarrow q$ means that, as long as we adopt a stance of epistemic neutrality between p and its natural alternative $p*$, where $p*$ is obtained by adding a negation to p, both p and $p*$ yield q, although p is less favorable than $p*$ for the realization of q.[18]

This view, like Bennett's view, provides a plausible explanation of observation 3. For example, 'The weather is good' and 'The weather is not good' are not equal with respect to (2) because Vidal's definition requires that 'The weather is not good' is less favorable than 'The weather is good' for Glen's plan to go out. The case of observations 1 and 2 is more complicated. Although Vidal maintains that $p \hookrightarrow q$ entails 'Whether or not p, q', as observation 1 suggests, he claims that $p \hookrightarrow q$ does not entail q, for even when both p and $p*$ lead to q, it can happen that p and $p*$ do not exhaust the range of possible circumstances, hence there are circumstances in which q does not hold. Like Bennett, Vidal thinks that there are cases in which $p \hookrightarrow q$ can be asserted without thereby implying q. For example, in the case of (13) he claims that $p*$ is 'does not drink just a little', which means 'drinks a lot'. So, even though both antecedents lead to 'He will be fired', they do not exhaust the range of possible circumstances.[19]

[15] Pollock [25], pp. 29-31.

[16] This view first appeared in Lycan [21], and then, in a revised version, in Lycan [22], pp. 115-138.

[17] Vidal [34] emphasizes the point about observation 3, p. 265-266.

[18] Vidal [34], pp. 260-261. We use $*$ instead of $\neg$ because it would be misleading to generally equate $p*$ with $\neg p$.

[19] Vidal [34], p. 262. Note that Vidal can consistently separate 'Whether or not p, q' from q because he does not take the former to be logically equivalent to q, see p. 266.

Our reservation here is the same that we expressed in connection with Bennett's view, namely, that (13) is not a concessive because its antecedent is intended to support its consequent. As far as we can see, examples of this kind do not necessarily speak against the claim that $p \hookrightarrow q$ entails q, unless one is willing to deny observation 2. Of course, Vidal *has* to say that (13) is a concessive, and the same goes for (17), since his theory entails that a conditional is concessive whenever it includes the word 'even'. But this is precisely the problem, or so we want to suggest.

Strict semantic accounts seem to face a dilemma: either one claims that q follows from $p \hookrightarrow q$ in accordance with observation 1, as suggested by Pollock and Lycan, or one claims that q does not follow from $p \hookrightarrow q$, as suggested by Vidal. In the first case, one is exposed to counterexamples such as (13) and (17). In the second, one is forced to classify these sentences as concessives, against observation 2. This dilemma stems from the very idea that inspires strict semantic accounts, namely, that the truth conditions of concessives are determined by the meaning of 'even if'.

We believe that there is something deeply wrong in this idea: concessives are not to be identified with a type of sentence, because they are essentially a type of content. A conditional can plausibly be understood as a concessive even though it does not contain 'even', and it can plausibly be understood as a nonconcessive in spite of containing 'even'. In this respect, it is misleading to talk about concessives and "even-if conditionals" as if they were the same thing. The difference between concessives and nonconcessives is revealed by the kind of paraphrases they admit, and is to some extent independent of the words they contain. So, although the word 'even' is typically associated with the concessive reading of 'if', its presence is neither sufficient nor necessary for such reading.[20]

Of course, a strict semanticist can claim that the cases in which a concessive is expressed without using 'even' can be treated as elliptical, that is, as cases in which 'even' is not explicitly used because it is taken for granted. However, no similar move can be made for the other kind of cases, namely, those in which 'even' occurs in the sentence but the sentence evidently involves some relation of support between antecedent and consequent. If the theory predicts that certain truth conditions are determined by the meaning of 'even if', the conditional expressed must be a concessive whenever 'even if' occurs. This is precisely what happens in the case of (13) and (17).

4 Straight Content-based Accounts

As Sections 2 and 3 suggest, each of the two kinds of accounts discussed faces serious problems. On the one hand, strict pragmatic accounts seem unable to provide a precise characterization of the logical behaviour of concessives. On the other, strict semantic accounts seem unable to explain why the presence of the word 'even' is neither necessary nor sufficient for that behaviour. Yet there is a third way to go. One may coherently hold that the distinction between concessives and nonconcessives is

[20]Pizzi [24], p. 81, and Gomes [12], pp. 8-20, contain considerations along these lines.

a matter of what is said, so it concerns truth rather than assertibility, without trying to reduce what is said to the meaning of the words that occur in the sentence. This is the route that we find most promising.

We believe that, for any conditional c, at least two distinct contents can be ascribed to c, depending on how c is understood, and that the concessive content — the content represented as $p \hookrightarrow q$ — is one of them. For example, although (1) is used in a nonconcessive sense in the situation described above, it could be used in a concessive sense in a different situation in which Glen likes going out with bad weather. Accordingly, we will assume that c can be formalized in at least two ways, depending on how it is understood.

This assumption may be illustrated by means of an analogy. As is well known, 'or' can be used either in an inclusive sense, meaning 'at least one', or in an exclusive sense, meaning 'at least one and at most one'. The second reading is usually triggered by the occurrence of 'either' at the beginning of the sentence. When 'or' is understood inclusively, the sentence in which it occurs is adequately formalized as $p \vee q$, provided that $\vee$ is defined in the usual way. When it is understood exclusively, instead, the sentence in which it occurs is adequately formalized as $(p \vee q) \wedge \neg(p \wedge q)$, where the second conjunct conveys the additional condition 'at most one'. So there are two distinct formulas, both of which contain the symbol $\vee$, and which represent two definite kinds of content.

We think that 'if' is similar to 'or' in this respect. A concessive — that is, a conditional that is understood concessively — resembles an exclusive disjunction in that it is adequately formalized by means of a formula including a condition that is not part of the nonconcessive reading of 'if'. Accordingly, the distinction between nonconcessives and concessives can be elucidated by means of two distinct formulas which represent two definite kinds of content. The presence of 'even', just like the presence of 'either', may help detect which of the two readings is intended, but it does not settle by itself the issue of formalization.

At least three proposals in this spirit, which may be classified as straight content-based accounts, have been advanced in the past, so we will briefly discuss them before presenting our analysis. In order to do so, it is convenient to introduce the symbols $>$ and $\triangleright$, which will occur in the rest of the paper. The first symbol encodes the suppositional interpretation as described in Section 2. The second is intended to convey a stronger interpretation which implies a relation of support between p and q, that is, $p \triangleright q$ means that p provides a reason for accepting q, or that q can be inferred from p.

The first proposal, initially suggested by Goodman and later advocated by Pizzi, is that concessives are "semifactuals" or "semiconditionals", that is, statements that deny that a certain connection obtains between the antecedent and the negation of the consequent. In other words, a concessive is a sentence of the form $\neg(p \triangleright \neg q)$, so it is a negation of a conditional rather than a kind of conditional.[21]

This formalization makes concessives rather weak, and consequently does not explain observations 1-3. Observation 1 is not vindicated because $\neg(p \triangleright \neg q)$ does

[21] Goodman [13], pp. 114-115, Pizzi [24], pp. 78-79.

not entail that q holds no matter whether p holds. In fact, contrary to what is plausible to expect from a concessive, it does not even entail $p > q$. Observation 2 is left unexplained because the lack of connection between p and $\neg q$ does not entail a similar lack of connection between p and q, even though violation of Supraclassicality is obtained by assuming that $\neg(p \triangleright \neg q)$ is false when p is impossible, for in that case $\neg q$ logically follows from p. Observation 3 is also left unexplained because no rationale is provided for thinking that $\neg p$ is more naturally related to q.

The second proposal, formulated by Gärdenfors in the framework of his belief revision theory of conditionals, is that concessives are sentences of the form $(p > q) \wedge (\neg p > q)$. In this case the idea is that a concessive amounts to a conjunction of conditionals, rather than to a single conditional.[22]

This formalization, unlike the previous one, explains observation 1. If $(p > q) \wedge (\neg p > q)$ is true, q holds no matter whether p holds, at least if q is simple or it only contains standard propositional connectives. In fact it is arguable that the converse is equally compelling, which suggests that 'Whether or not p, q' is adequately formalized as $(p > q) \wedge (\neg p > q)$. Observation 2 is explained as long as it is assumed that p cannot support q when q holds no matter whether p holds, which is not an uncontentious claim.[23] However, observation 3 is left unexplained, for p and $\neg p$ turn out to be equal in all respects. As noted in Section 1, $p \hookrightarrow q$ seems stronger than 'Whether or not p, q' just in virtue of the apparent asymmetry between p and $\neg p$, while the proposal under consideration makes it exactly as strong.[24]

The third proposal emerges from Douven's epistemic treatment of conditionals. According to Douven, a concessive is acceptable just in case its consequent is highly probable given its antecedent but is not supported by its antecedent, where lack of support is understood as lack of increase of the probability of the consequent. If framed in terms of our two symbols, Douven's analysis may be translated into $(p > q) \wedge \neg(p \triangleright q)$, meaning that $P(q|p)$ is high (relative to some threshold) and that $P(q|p) \leq P(q)$.[25]

On this view, observation 1 is preserved at least on some understanding of 'Whether or not p, q', for arguably q holds given p but not in virtue of p. Observation 2 is obtained simply by definition. Observation 3, however, is not vindicated. If $P(q)$ is high, but p and $\neg p$ are irrelevant to q — in that $P(q|p) = P(q|\neg p)$ — we get the symmetrical result that, for both antecedents, q is highly probable but not supported. Although Douven's definition involves an element of asymmetry between p and $\neg p$, this does not always ensure an asymmetric outcome when the criterion is applied, as observation 3 requires.

[22] Gärdenfors [11], p. 153. The specific traits of Gärdenfors' theory do not matter as far as our use of the symbol $>$ is concerned.

[23] For example, the account of support as difference-making developed in Rott [28] and Rott [29], and in Spohn [31] and Spohn [32], conveys precisely this claim.

[24] Gärdenfors [11], appeals to the distinction between truth and assertibility to explain away the apparent asymmetry between p and $\neg p$, p. 153. This is the same kind of move that characterizes strict pragmatic accounts, and it is hard to see why it should be made exactly at this point of the story.

[25] Douven and Verbrugge [9], p. 486, Douven [8], p. 119.

It is interesting to note, however, that a minor change in Douven's account would suffice to overcome this problem. Instead of requiring as a second conjunct that $P(q|p) \leq P(q)$, it might be required that $P(q|p) < P(q)$. The second conjunct would thus imply something stronger than lack of support from p to q, that is, it would imply support from $\neg p$ to q in Douven's sense, given that $P(q|p) < P(q)$ if and only if $P(q|\neg p) > P(q)$. As a consequence, observation 3 would be vindicated, because when $P(q)$ is high but p and $\neg p$ are irrelevant to q we get that neither $P(q|p) < P(q)$ nor $P(q|\neg p) < P(q)$. Note that, if observation 3 is explained in terms of support from $\neg p$ to q, then observation 2 simply follows on the plausible assumption that p and $\neg p$ cannot both support q.[26] As we shall see, this amended version of Douven's account is the closest approximation to our analysis. Although we will adopt a different definition of support, our idea is precisely that $p \hookrightarrow q$ entails that $\neg p$ supports q.

5 Our Analysis

The idea that guides our analysis is that the logical form of a sentence as used in a given context is determined by the content expressed by the sentence in that context, where 'content' is understood as synonymous with 'truth conditions'. According to this idea, which has been articulated and defended by Iacona for independent reasons, insofar as a sentence can have different truth conditions in different contexts, its logical form is not deducible from intrinsic properties such as syntactic or semantic structure. In this sense our analysis is a straight content-based account, as it takes the distinction between concessives and nonconcessives to be essentially a matter of what is said.[27]

We believe that a concessive is adequately formalized as a conjunction, as in the case of Gärdenfors and Douven, but with a different second conjunct.

Definition 1 A concessive is a sentence of the form $(p > q) \wedge (\neg p \triangleright q)$.

In other words, $p \hookrightarrow q$ says that q holds on the supposition that p holds, and that $\neg p$ supports q. For example, (2) says that it is credible that Glen will go out in case the weather is not good, and that one can infer that Glen will go out from the assumption that the weather is good.

In order to provide a proper formal treatment of concessives based on Definition 1, it suffices to adopt a modal semantics that specifies the meaning of $>$ and $\triangleright$ in terms of comparative measures of distance between worlds. We will assume that $\alpha > \beta$ is true if and only if β is true in the closest worlds in which α is true. This is essentially the Ramsey Test as understood in the modal version of the suppositional interpretation. As for $\triangleright$, it will be defined in accordance with the evidential account

[26] We would like to thank an anonymous reviewer for drawing our attention to this variant of Douven's account.

[27] Iacona [16].

of conditionals developed by Crupi and Iacona, that is, $\alpha \rhd \beta$ is true if and only if β is true in the closest worlds in which α is true and α is false in the closest worlds in which β is false. This stronger condition, called Chrysippus Test, ensures that a suitably defined relation of incompatibility holds between α and $\neg\beta$.[28]

Let L be a language whose symbols are the letters $p, q, r, ...$, the connectives $\neg, \wedge, \vee, \supset, >, \rhd, \Diamond$, and the brackets (,). The formulas of L are defined as follows: $p, q, r...$ are formulas; if α is a formula, $\neg\alpha$ and $\Diamond\alpha$ are formulas; if α and β are formulas, $\alpha \wedge \beta, \alpha \vee \beta, \alpha > \beta, \alpha \rhd \beta$ are formulas. The semantics for L can be defined in more than one way. A model of L will include a set of worlds W and a valuation function V that assigns 1 or 0 to each atomic formula relative to each w in W. But there are different ways to represent comparative measures of distance between worlds, as is well known: one can adopt systems of spheres, selection functions, possibility measures, or similar notions. For present purposes it will suffice to talk about closeness of worlds, assuming that some precise characterization of this relation is provided by the models of L.[29]

The truth conditions of a formula α in a world w in a model are defined as follows, where $[\alpha]_w$ indicates the value — 1 or 0 — that α takes in w:

Definition 2

1 If α is atomic, $[\alpha]_w = 1$ iff $V(\alpha, w) = 1$;
2 $[\neg\alpha]_w = 1$ iff $[\alpha]_w = 0$;
3 $[\alpha \wedge \beta]_w = 1$ iff $[\alpha]_w = 1$ and $[\beta]_w = 1$;
4 $[\alpha \vee \beta]_w = 1$ iff either $[\alpha]_w = 1$ or $[\beta]_w = 1$;
5 $[\alpha \supset \beta]_w = 1$ iff either $[\alpha]_w = 0$ or $[\beta]_w = 1$;
6 $[\alpha > \beta]_w = 1$ iff the following condition holds:

(a) for every w', if $[\alpha]_{w'} = 1$ and there is no closer w'' such that $[\alpha]_{w''} = 1$, then $[\beta]_{w'} = 1$;

7 $[\alpha \rhd \beta]_w = 1$ iff the following conditions hold:

(a) for every w', if $[\alpha]_{w'} = 1$ and there is no closer w'' such that $[\alpha]_{w''} = 1$, then $[\beta]_{w'} = 1$;
(b) for every w', if $[\beta]_{w'} = 0$ and there is no closer w'' such that $[\beta]_{w''} = 0$, then $[\alpha]_{w'} = 0$;

8 $[\Diamond\alpha]_w = 1$ iff, for some w', $[\alpha]_{w'} = 1$.

In clauses 6 and 7, (a) expresses the Ramsey Test: β must be true in the closest worlds in which α is true. In clause 7, (b) expresses a reverse version of the Ramsey Test: α must be false in the closest worlds in which β is false. The conjunction of

[28] Crupi and Iacona [5] develops the evidential account and explains its relation to the intuitive understanding of support.
[29] Lewis [19], pp. 44-64, spells out these alternatives and shows their equivalence.

(a) and (b) amounts to the Chrysippus Test. The satisfaction of the Chrysippus Test ensures that α and $\neg\beta$ are incompatible in the sense suggested.[30]

Validity is defined in terms of truth in a world in a model, and logical consequence is defined accordingly for every finite set of formulas α_1, ..., α_n and every formula β.

Definition 3 $\vDash \alpha$ iff α is true in every world in every model.

Definition 4 $\alpha_1, \ldots, \alpha_n \vDash \beta$ iff $\vDash (\alpha_1 \wedge \cdots \wedge \alpha_n) \supset \beta$.

We will close this section by drawing attention to some basic facts that derive from the definitions just outlined and will be useful for our discussion of concessives. The first two facts state well known truths about $>$, namely, Modus Ponens and a restricted version of Abelard's First Principle.[31]

Fact 1 $\alpha > \beta, \alpha \vDash \beta$

Proof Assume that $[\alpha > \beta]_w = 1$ and $[\alpha]_w = 1$. In this case there is no closer w' such that $[\alpha]_{w'} = 1$. By clause 6 of Definition 2 it follows that $[\beta]_w = 1$. □

Fact 2 $\Diamond\alpha \vDash \neg((\alpha > \beta) \wedge (\alpha > \neg\beta))$

Proof Assume that $[\Diamond\alpha]_w = 1$. Then, either clause 6 of Definition 2 is satisfied for $\alpha > \beta$, in which case $[\alpha > \neg\beta]_w = 0$, or it is not satisfied, in which case $[\alpha > \beta]_w = 0$. In any case, $[(\alpha > \beta) \wedge (\alpha > \neg\beta)]_w = 0$, hence $[\neg((\alpha > \beta) \wedge (\alpha > \neg\beta))]_w = 1$. □

The third fact spells out the sense in which $\rhd$ is stronger than $>$.

Fact 3 $\vDash \alpha \rhd \beta \equiv (\alpha > \beta) \wedge (\neg\beta > \neg\alpha)$

Proof Assume that $[\alpha \rhd \beta]_w = 1$. Since (a) in clause 7 of Definition 2 holds for α and β, $[\alpha > \beta]_w = 1$. Since (b) holds for α and β, (a) holds for $\neg\beta$ and $\neg\alpha$, hence $[\neg\beta > \neg\alpha]_w = 1$. Therefore, $[(\alpha > \beta) \wedge (\neg\beta > \neg\alpha)]_w = 1$. The proof of the right-to-left direction is similar. □

This fact is important because it shows that $\rhd$ is definable in terms of $>$, so the use of $\rhd$ in the formulation of our analysis is dispensable. Definition 1 could equally

[30] This notion of incompatibility can also be spelled out in probabilistic terms. As Crupi and Iacona [7] shows, a quantitative measure of evidential support conveying the Chrysippus Test is definable in a probabilistic semantics which converges with the modal semantics outlined here in all relevant respects. The definition significantly differs from the characterization of evidential support employed by Douven in his treatment of conditionals. See Crupi and Iacona [6] for a detailed comparison with Douven.

[31] Abelard's First Principle may also be called Weak Boethius' Thesis, see Wansing [35].

be rephrased by saying that a concessive is a sentence of the form $(p > q) \wedge (\neg p > q) \wedge (\neg q > p)$. This means that $>$ may be regarded as basic in some sense.[32]

Finally, the following two facts specifically concern $\rhd$.

Fact 4 $\alpha \rhd \beta \vDash \neg\beta \rhd \neg\alpha$

Proof Assume that $[\alpha \rhd \beta]_w = 1$. Then, $[(\alpha > \beta) \wedge (\neg\beta > \neg\alpha)]_w = 1$ by Fact 3, hence $[(\neg\neg\alpha > \neg\neg\beta) \wedge (\neg\beta > \neg\alpha)]_w = 1$. Therefore, again by Fact 3, $[\neg\beta \rhd \neg\alpha]_w = 1$. □

Fact 5 $\Diamond\neg\beta \vDash \neg((\alpha \rhd \beta) \wedge (\neg\alpha \rhd \beta))$

Proof Assume that $[\Diamond\neg\beta]_w = 1$ and $[\alpha \rhd \beta]_w = 1$. Then, $[\neg\beta \rhd \neg\alpha]_w = 1$ by Fact 4. So, $[(\neg\beta > \neg\alpha) \wedge (\neg\neg\alpha > \neg\neg\beta)]_w = 1$ by Fact 3. From the first conjunct and Fact 2 we get that $[\neg\beta > \neg\neg\alpha]_w = 0$. Since $[\neg\alpha \rhd \beta]_w = [(\neg\alpha > \beta) \wedge (\neg\beta > \neg\neg\alpha)]_w$ by Fact 3, it follows that $[\neg\alpha \rhd \beta]_w = 0$. □

Facts 4 and 5 show that $\rhd$ validates Contraposition and Restricted Aristotle's Second Thesis. This is a key difference between $\rhd$ and $>$, since neither of these two principles hold for $>$. As is easy to verify, the relevant counterexamples are cases in which $\alpha > \beta$ is true in a world without $\alpha \rhd \beta$ being true in that world.

6 The logic of Concessives

Now we will show how observations 1-3 can be explained in terms of the semantics just outlined. On the assumption that a concessive is adequately formalized as $(p > q) \wedge (\neg p \rhd q)$ — or equivalently, that $p \hookrightarrow q$ is definable as $(p > q) \wedge (\neg p \rhd q)$ — it turns out that each of these observations reveals a definite logical property of concessives.

Let us start with observation 1. The reason why $p \hookrightarrow q$ seems to imply that q holds no matter whether p holds is that $(p > q) \wedge (\neg p > q)$ logically follows from $p \hookrightarrow q$. That is,

Fact 6 $\alpha \hookrightarrow \beta \vDash (\alpha > \beta) \wedge (\neg\alpha > \beta)$

Proof From Definition 1 and Fact 3. □

A direct corollary of Fact 6 is that $\alpha \hookrightarrow \beta \vDash \beta$, since $(\alpha > \beta) \wedge (\neg\alpha > \beta) \vDash \beta$ by Fact 1. Consequently, even if 'Whether or not p, q' were formalized as $(p \supset$

[32]The use of $>$ as basic is in line with the project outlined in Raidl [26], where several kinds of conditionals are defined in terms of $>$.

$q) \wedge (\neg p \supset q)$, or by means of some other formula logically equivalent to q, we would still get that 'Whether or not p, q' logically follows from $p \hookrightarrow q$.

Observation 2 is explained by the second conjunct of the formula that defines $p \hookrightarrow q$, that is, $\neg p \rhd q$, for as long as q is not necessary, $\neg p \rhd q$ entails $\neg(p \rhd q)$.

Fact 7 $\alpha \hookrightarrow \beta, \Diamond\neg\beta \vDash \neg(\alpha \rhd \beta)$

Proof Assume that $[(\alpha > \beta) \wedge (\neg\alpha \rhd \beta)]_w = 1$ and $[\Diamond\neg\beta]_w = 1$. The first assumption yields that $[(\neg\alpha \rhd \beta)]_w = 1$. From this and the second assumption, by Fact 5, we get that $[\alpha \rhd \beta]_w = 0$. Therefore, $[\neg(\alpha \rhd \beta)]_w = 1$. □

As noted in connection with observation 2, we get that Supraclassicality does not hold for concessives:

Fact 8 It can be the case that $\alpha \vDash \beta$ and $[\alpha \hookrightarrow \beta]_w = 0$ for some w.

Proof Let $\alpha = \beta$, and suppose that $[\Diamond\neg\alpha]_w = 1$. Then $\alpha \vDash \beta$, because $\alpha \vDash \alpha$. But $[(\alpha > \beta) \wedge (\neg\alpha \rhd \beta)]_w = 0$, because $[\neg\alpha \rhd \alpha]_w = 0$. □

Observation 3, just like observation 2, is explained by the second conjunct: $\neg p \rhd q$ says that $\neg p$ provides a reason for accepting q, which makes the connection between $\neg p$ and q strong in a way in which the connection between p and q is not. It is in virtue of this feature that $p \hookrightarrow q$ does not follow from 'Whether or not p, q'.

Fact 9 $(\alpha > \beta) \wedge (\neg\alpha > \beta) \nvDash \alpha \hookrightarrow \beta$

Proof Suppose that $[(\alpha > \beta) \wedge (\neg\alpha > \beta)]_w = 1$ but $[\neg\beta > \alpha]_w = 0$ because the closest worlds in which β is false are worlds in which α is false. In this case $[\neg\alpha \rhd \beta]_w = 0$, and consequently $[(\alpha > \beta) \wedge (\neg\alpha \rhd \beta)]_w = 0$. □

This fact shows the sense in which our formalization is stronger than that proposed by Gärdenfors: as noted in Section 5, $(p > q) \wedge (\neg p \rhd q)$ is equivalent to $(p > q) \wedge (\neg p > q) \wedge (\neg q > p)$, so our formula is obtained by adding to Gärdenfors' formula precisely the conjunct that prevents $p \hookrightarrow q$ from being equivalent to 'Whether or not p, q'.

So far we have focused on observations 1-3 because they disclose some distinctive features of concessives whose combination is far from trivial, as it emerges from the discussion of the accounts considered in Sections 2–4. But other facts can easily be proved, which concern properties of concessives that are no less interesting, such as those stated in observations 4-6.

Observation 4 is explained by the fact that Restricted Aristotle's Second Thesis holds for concessives:

Fact 10 $\Diamond\neg\beta \vDash \neg((\alpha \hookrightarrow \beta) \wedge (\neg\alpha \hookrightarrow \beta))$

Proof Assume that $[\Diamond\neg\beta]_w = 1$ and $[(\alpha > \beta) \wedge (\neg\alpha \rhd \beta)]_w = 1$. The second assumption yields that $[\neg\alpha \rhd \beta]_w = 1$. From this and the first assumption, by Fact 5, we get that $[\neg\neg\alpha \rhd \beta]_w = 0$. It follows that $[(\neg\alpha > \beta) \wedge (\neg\neg\alpha \rhd \beta)]_w = 0$. □

Observation 5 is explained by the fact that Contraposition does not hold for concessives:

Fact 11 $\alpha \hookrightarrow \beta \not\models \neg\beta \hookrightarrow \neg\alpha$

Proof This is due to the fact that $\alpha > \beta$ does not entail $\neg\beta > \neg\alpha$, as noted in Section 5. □

Observation 6, which concerns the anomaly about Modus Tollens, is explained by the fact that $\alpha \hookrightarrow \beta \models \neg\beta > \alpha$ by definition. If one assumes $p \hookrightarrow q$ and $\neg q$ as premises, from $\neg q > p$ and $\neg q$, given Fact 1, one can infer p, which contradicts the conclusion $\neg p$. Note also that, given Fact 6, the two premises are inconsistent, just as it appears, for the first entails q.

Further properties that concessives share with nonconcessives can easily be proved. For example, it is a direct consequence of Fact 1 that Modus Ponens holds for $\hookrightarrow$. Similarly, it can be proved that some principles that arguably fail for nonconcessives, such as Monotonicity or Transitivity, fail for concessives as well. In general, the semantics provided is able to explain a wide range of logical properties that can plausibly be attributed to concessives.

7 Concessives and Nonconcessives

This paper focuses on the logical form of concessives, so it does not intend to provide an account of nonconcessives. As it emerges from our use of $>$ and $\rhd$, the analysis of concessives outlined in the foregoing sections is compatible with at least three distinct options.

The first option is to claim that nonconcessives are sentences of the form $p > q$, so the apparent dissimilarities between nonconcessives and concessives are explainable in terms of the difference between $p > q$ and $(p > q) \wedge (\neg p \rhd q)$. This option may suit those who are apt to think that the suppositional interpretation captures the intuitive meaning of ‘if’ but agree with us that a strict pragmatic approach can hardly provide the whole story about concessives. Note that, if nonconcessives were sentences of the form $p > q$, the analogy between the case of nonconcessives/concessives and the case of inclusive/exclusive disjunction would be very close, for $>$ would play in the former case the same role that $\vee$ plays in the latter.

The second option is to claim that nonconcessives are sentences of the form $p \rhd q$, so the apparent dissimilarities between nonconcessives and concessives are explainable in terms of the difference between $p \rhd q$ and $(p > q) \wedge (\neg p \rhd q)$. This option may be congenial to those who think that the notion of support plays an essential role in the understanding of conditionals, and accept the reading of $\rhd$ suggested here as an adequate characterization of that notion. Note that if nonconcessives were sentences of the form $p \rhd q$, one could still treat $>$ as basic, and define both kinds of content in terms of one and the same connective. To this it may be added that, just as $\rhd$ is definable in terms of $>$, $>$ is definable in terms of $\rhd$, so the same option could be rephrased by using $\rhd$ as basic.[33]

The third option is to adopt a weaker position and claim that nonconcessives are adequately formalized either as $p > q$ or as $p \rhd q$, depending on how they are understood. In this case, the view is that the suppositional and the evidential interpretation are equally plausible in terms of language use or psychological reality, so there are at least two admissible nonconcessive readings of 'if'. No matter which of the two readings is adopted, the contrast between concessives and nonconcessives turns out to be explainable in the ways suggested in connection with the first two options.

Each of these three options entails that nonconcessives significantly differ from concessives from the logical point of view. As far as observations 1-3 are concerned, both $>$ and $\rhd$ differ from $\hookrightarrow$, as is easy to verify, so they are exactly alike in this respect. The divergence between $>$ and $\rhd$, instead, emerges in connection with Restricted Aristotle's Second Thesis and Contraposition. We have seen that Restricted Aristotle's Second Thesis holds for $\hookrightarrow$ and $\rhd$ but not for $>$. So, only $>$ differs from $\hookrightarrow$ in this respect. In the case of Contraposition, instead, only $\rhd$ differs from $\hookrightarrow$ because Contraposition holds for $\rhd$ but not for $\hookrightarrow$ and $>$.

We believe that a major virtue of the account outlined in this paper is that it provides a clear and precise explanation of the distinctive logical behaviour of concessives. Of course, the formula that we take to define $p \hookrightarrow q$ is not the first thing that comes to mind when one uses a concessive. But there is no reason to think that it should, at least if one shares the conviction that uncovering the logical form of a sentence may require a substantive work of analysis. Russell's paraphrase of sentences containing definite descriptions is surely not the first thing that comes to mind when one uses such a sentence. But this does not undermine its credibility. Perhaps, what Russell says in the last lines of *On Denoting* applies, *mutatis mutandis*, to our case:

> I will only beg the reader not to make up his mind against the view — as he might be tempted to do, on account of its apparently excessive complication — until he has attempted to construct a theory of his own on the subject of denotation. This attempt, I believe, will convince him that, whatever the true theory may be, it cannot have such a simplicity as one might have expected beforehand.[34]

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