Folk Judgments About Conditional Excluded Middle

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In this chapter we consider three philosophical perspectives (including those of Stalnaker and Lewis) on the question of whether and how the principle of conditional excluded middle should figure in the logic and semantics of counterfactuals. We articulate and defend a third view that is based upon belief revision theories in the tradition of the Ramsey Test. Unlike Lewis' view, the belief revision perspective does not reject conditional excluded middle, and unlike Stalnaker's, it does not embrace supervaluationism. We adduce both theoretical and empirical considerations to argue that the belief revision perspective should be preferred to its alternatives. The empirical considerations are drawn from the results of four empirical studies (which we report below) of non-experts' judgments about counterfactuals and conditional excluded middle.

Keywords: conditional excluded middle, excluded middle, counterfactuals, Lewis, Stalnaker, Quine, supervaluationism, experimental philosophy

1. Introduction[1]

At least since W. V. Quine introduced the Bizet/Verdi case in 1950 there has been

significantcontroversy not only about the possibility of there being any adequate analysis of the

logic of counterfactual conditionals, but also more specifically about the acceptability of the

principle known as conditional excluded middle (CEM).[2] Conditional excluded middle is usuallt

parsed as follows:

$$(CEM) \ (A > C) \vee (A > {\sim}C).$$

In other words, for any pair of conditionals with a common antecedent and whose consequents

are either a statement or its negation, at least one of the conditionals must be true. CEM is a

consequence of what Daniel Bonevac calls 'Stalnaker's rule'.[3] This is stated as follows:

$$(SR) \quad \frac{{\sim}(A > C)}{A > {\sim}C}$$

The acceptability of CEM was a particular bone of contention between Robert Stalnaker and

David Lewis in developing their respective accounts of the logic and semantics of

counterfactuals in the late 1960s and 1970s. Stalnaker ultimately argued that this principle should

be incorporated in the logic of counterfactuals, and in so doing he favored the conditional logic

C2. On this basis he argued further that we must introduce vagueness into the semantics for such

conditionals.[4] In point of fact, he advocated doing this via the use of the theory of

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[1] The exposition in the opening sections of this paper closely follows Shaffer, M. "What if Bizet and Verdi had been Compatriots?" *Logos & Episteme* 7 (2016): 55-63 (2016).
[2] Quine, W. V., *Methods of Logic* (New York: Holt, Reinhart and Winston, 1950).
[3] Bonevac, D., *Deduction, 2nd ed.* (Oxford: Blackwell, 2003).
[4] Stalnaker, R., "A Defense of Conditional Excluded Middle," in *Ifs*, eds.W. Harper, R. Stalnaker and G. Pearce (Dordrecht: D. Reidel, 1981), 87-104.

supervaluations that had previously been developed by Bas van Fraassen.[5] The result is a semantic theory that allows conditionals in Stalnaker's logic to be true, false, or indeterminate.

The main reasons why he advocated this approach to the semantics of counterfactuals are twofold. First, it is supposed to explain our inability to choose a unique and most acceptable conditional from among competing conditionals like those in the Bizet/Verdi case. Second, it supports Stalnaker's personal conviction that CEM is a plausible principle for conditional logic. However, as we shall see, our inability to choose a unique most epistemically acceptable conditional from among competing conditionals in Bizet/Verdi cases can be better explained without recourse to a semantics that incorporates vagueness.[6] In this paper, we test Stalnaker's and Lewis' theories against an alternative theory that also explains the inability to choose between competing conditionals on the basis of purely epistemic considerations. In addition to adducing theoretical reasons in support of the epistemic alternative, we report the results of four empirical studies of folk judgments about counterfactuals and CEM in order to see which theory best fits with lay intuitions.

This debate importantly arose in virtue of the following pair of conditionals that Quine famously discussed in his 1950 book:

(BV1) If Bizet and Verdi had been compatriots, Bizet would have been Italian.

(BV2) If Bizet and Verdi had been compatriots, Verdi would have been French.

What this pair of conditionals is supposed to show is that there can be ties in terms of the closeness of non-actual possible worlds and so Stalnaker's analysis of the logic of

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[5] Van Fraassen, B., "Singular Terms, Truth-value Gaps and Free Logic," *Journal of Philosophy* 63 (1966): 481-495.
[6] Shaffer, M., "What if Bizet and Verdi had been Compatriots?" *Logos & Episteme* 7 (2016): 55-63.

counterfactuals is supposed to fail. The basic idea here is that there is good reason to suppose that worlds where Bizet and Verdi are both French or are both Italian are more similar to the actual world than worlds where they are, for example, Nigerian, Australian, or Sri Lankan. Yet it seems to be the case that there is no good reason to suppose either that the world where they are both Italian is closer to the actual world than the world where they are both French or that the world where they are both French is closer to the actual world than the world where they are both Italian. These two non-actual worlds seem to be *equally* close to the actual world. As a result, there does not seem to be any reason to treat one conditional as more acceptable than the other. So, more controversially, there is supposed to be no reason to suppose that the first conditional is to be regarded as true and the second as false or vice versa. However, let us look more closely at how this problem arises and why Stalnaker responds to the Bizet/Verdi case in the way that he does.

Stalnaker and Lewis independently proposed accounts of the logic of counterfactuals in the late 1960s and early 1970s. While these two theories are very similar formally, they were presented on the basis of somewhat different semantic ideas. Nevertheless, these semantic differences are largely superficial, with the exception of one major point of disagreement that in turn reflects a major difference in terms of the formal principles characterizing the two different conditional logics they ended up endorsing. Let us begin by looking at the semantics for these two accounts of counterfactuals.

Stalnaker's semantics for counterfactuals was presented in terms of possible worlds and the concept of a selection function.[7] The selection function f takes a proposition and possible world pairs into a possible world. For Stalnaker, the truth conditions for counterfactuals are given as follows:

(C1) A > B is true at world i, if and only if, B is true at f(A, i).

Of course, f is governed by a number of well-known constraints.

Alternatively, Lewis' semantics for counterfactuals was presented in terms of a comparative similarity relation.[8] Where S(i, j, k) means that j is more similar to i than k is to i, Lewis gives the truth conditions for counterfactuals as follows:

(C2) A > B is true, if and only if, there is a A-world j such that B is true at j and all in all A-worlds at least as similar to i as to j.

Stalnaker, however, showed that the choice of presenting semantics in terms of a selection function or in terms of a comparative similarity relation is really arbitrary.[9] Nevertheless, the two theories of counterfactuals that arise from these semantic bases and the constraints imposed on them are not strictly equivalent. It turns out that Stalnaker's theory is really just a special, more restricted case of Lewis' theory. Lewis' theory involves a well-ordering of possible worlds while Stalnaker's theory involves only a weak total ordering of possible worlds. In turn, this gives rise to the crucial point where the theories differ. Stalnaker's theory assumes what Lewis called the limit and uniqueness assumptions. The details of the limit assumption are not important here, but

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[7] Stalnaker, R. "A Theory of Conditionals," in *Studies in Logical Theory* (Oxford: Blackwell, 1968), 98-112.
[8] Lewis, D., *Counterfactuals* (Cambridge: Harvard University Press, 1973).
[9] Stalnaker, R., "A Defense of Conditional Excluded Middle," in *Ifs*, eds.W. Harper, R. Stalnaker and G. Pearce (Dordrecht: D. Reidel, 1981), 87-104.

acceptance of it and the uniqueness assumption is what gives rise to the problems associated with

CEM noted above.[10] The uniqueness assumption can be stated as follows:

(Uniqueness) For every world i and proposition A there is at most one A-world

minimally different from i.

Accepting both of these assumptions amounts to the acceptance of CEM, but the uniqueness

assumption effectively rules out ties in the similarity of worlds. If this principle is true, then there

cannot be two worlds that are equally similar to a given possible world.

Stalnaker admits that this is an idealization that he has made with respect to the semantics

of counterfactuals, specifically with respect to the selection function.[11] Moreover, he defends this

view on the basis of his own personal "unreflective linguistic intuition"[12] and argues essentially

that treating both of the Bizet/Verdi counterfactuals as indeterminate in truth value better reflects

these semantic intuitions than Lewis' view, where they both turn out to be false.

2. Coherence as a Guide to Counterfactual Acceptance

Stalnaker and Lewis developed their semantic views of counterfactuals in terms of truth

conditions, and both of their views were specifically framed in terms of possible worlds.

However, we do not think the issue of the acceptability of CEM should turn on purely semantic

considerations. Rather, what is needed is a clear account of the acceptability conditions for

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[10]See Cross, C., "Conditional Excluded Middle," *Erkenntnis* 70 (2009): 173-188 for discussion of the relationship between the limit assumption, the uniqueness assumption and the principle of counterfactual consistency.
[11] Stalnaker, R., "A Defense of Conditional Excluded Middle," in *Ifs*, eds.W. Harper, R. Stalnaker and G. Pearce (Dordrecht: D. Reidel, 1981), 89.
[12] Stalnaker, R., "A Defense of Conditional Excluded Middle," in *Ifs*, eds.W. Harper, R. Stalnaker and G. Pearce (Dordrecht: D. Reidel, 1981), 92.

counterfactuals that explains the resistance to CEM and Bizet/Verdi type cases. Fortunately, there has been considerable discussion of this matter in the debate about the Ramsey test for conditional acceptance that is so-named because of Ramsey's brief footnote comment made in a paper in 1929.

In this vein, Carlos Alchourrón, Peter Gärdenfors, and David Makinso developed the AGM theory of belief revision in the 1980s and a number of related theories have arisen as a consequence.[13] The theory developed here we will specifically framed in terms of the version of this view presented in Gärdenfors (1988). These theories are fundamentally based on the concept of a belief state K, typically satisfying the following minimal conditions and where belief states are given a representation in some language L:

(BS) A set of sentences, K, is a belief state if and only if (i) K is consistent, and (ii) K is objectively closed under logical implication.

The content of a belief state is then defined as the set of logical consequences of K (so $\{b: K \in b\} =_{df.} Cn(K)$). Given this basic form of epistemic representation, the AGM-type theories are intended to be a normative theory about how a given belief state satisfying BS is related to other belief states relative to: (1) the addition of a new belief b to K_i, or (2) the retraction of a belief b from K_i, where $b \in K_i$. Belief changes of the latter kind are *contractions*, but belief changes of the former kind must be further sub-divided into those that require giving up some elements of K_i and those that do not. Additions of beliefs that do not require giving up previously held beliefs

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[13] See Alchourrón, C., P. Gärdenfors and D. Makinson, "On the Logic of Theory Change: Partial Meet Functions for Contraction and Revision," *Journal of Symbolic Logic* 50 (1985): 510-30, Gärdenfors, P., *Knowledge in Flux* (Cambridge: MIT Press, 1988) and Levi, I., *For the Sake of the Argument: Ramsey test Conditionals, Inductive Inference, and Nonmonotonic Reasoning* (Cambridge: Cambridge University Press, 1996).

are *expansions*, and those that do are *revisions*.[14] Specifically, for our purposes here it is the concept of a revision that is of crucial importance to the issue of providing an account of rational commitment for conditionals. In any case, given AGM-style theories the dynamics of belief are simply the epistemically normative rules that govern rational cases of contraction, revision, and expansion of belief states.

The fundamental insight behind these theories is that belief changes that are contractions should be fundamentally conservative in nature. In other words, in belief changes one ought to make the minimal alterations necessary to incorporate new information and to maintain or restore logical consistency. This fundamental assumption is supposed to be justified in virtue of a principle of informational economy. This principle holds that information is intrinsically and practically valuable and so we should retain unless we are forced to do otherwise. So, while the details are not important here, the revision operations on belief states are restricted so as to obey such a principle of minimal mutilation.

What is important to the topic of this paper is that on the basis of such theories of belief revision, the defenders of this approach to belief dynamics have also proposed that one could also give a theory of rational conditional commitment.[15] The core concept of this theory is the Ramsey Test:[16]

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[14] In point of fact the AGM theory really only holds that there are two dynamical operations on belief states, because revision is defined in terms of expansion and contraction.

[15] See Gärdenfors, P., "An Epistemic Approach to Conditionals," *American Philosophical Quarterly* 18 (1981): 203-211, Gärdenfors, P., *Knowledge in Flux* (Cambridge: MIT Press, 1988) and Gärdenfors, P., "Imaging and Conditionalization," *The Journal of Philosophy* 79 (1982): 747-760.

[16] See Ramsey, F. P., "Laws and Causality," reprinted in *F.P. Ramsey: Philosophical Papers*, ed. D. H. Mellor (Cambridge: Cambridge University Press, 1929/1990). See Shaffer, M., "Three Problematic Theories of Conditional Acceptance," *Logos & Episteme* 1 (2011): 117-125 and Shaffer, M., "Doxastic Voluntarism, Epistemic Deontology

(RT) Accept a sentence of the form A > C in the state of belief K if and only if the minimal change of K needed to accept A also requires accepting C.[17]

Even in this quasi-formal form we can see what these theorists have in mind. The Ramsey Test requires that we modify our beliefs by accepting A into our standing system of beliefs and then see what the result is.[18] This view is typically framed in terms of a version of the epistemological coherence theory of justification and this seems natural given BS.[19] The idea is that one's beliefs are justified to the degree that they hang together or are mutually supportive. The idea then is that our belief system is justified in virtue of this feature of the system as a whole, and there are several extant version of coherence theory that are plausible views of justification.[20] The most famous are of course those of Laurence BonJour and Keith Lehrer, but Paul Thagard's version is also a well-regarded and more recent version of coherentism.[21] In any case, we need not get

and Belief-contravening Commitments," *American Philosophical Quarterly* 50 (2013): 73-82 for some discussions of problems for naïve formulations of the Ramsey test.

[17] For a relatively recent discussion of RT and related views see Levi, I., *Mild Contraction* (Oxford: Oxford University Press, 2004).

[18] Sanford, D., *If P, then Q*, 2nd ed. (New York: Routledge, 2003) contains the objection that in many cases where the antecedent of such a conditional is a radical departure from what we believe to be the case, we cannot in fact employ the Ramsey test because we do not know what would be the case if we believed such an antecedent. So, he claims that many conditions are simply void, rather than true or false. It is worth pointing out here that Sanford's criticism is weak at best. It simply does not follow that because we cannot always clearly determine what would be the case if we were to believe some claim, a conditional with such an antecedent has no truth value. See chapters 5 and 6 of Williamson, T., *The Philosophy of Philosophy* (Blackwell, Oxford, 2007) for discussion of one suggestion for how such knowledge might be obtained.

[19] See Gärdenfors, P., "The Dynamics of Belief Systems: Foundations Versus Coherence Theories," in *Knowledge, Belief and Strategic Interaction*, eds. C. Bicchieri, M. Dalla Chiara (Cambridge: Cambridge University Press, 1992) for the most thorough defense of the AGM theory in terms of coherentism. See Shaffer, M., "Coherence, Justification, and the AGM Theory of Belief Revision," in *Perspectives on Coherentism*, ed. Y. Bouchard (Ontario: Aylmer-Éditions du Scribe, 2002) for some worries about this view.

[20] There is of course some controversy about such views, especially those that are framed in terms of probabilistic notions of coherence. See Bovens, L. and S. Hartmann, *Bayesian Epistemology*, (Oxford: Oxford University Press, 2003) and Olsson, E., *Against Coherence,* (Oxford: Oxford University Press, 2005) for discussion of this matter.

[21] See BonJour, L., *The Structure of Empirical Knowledge* (Cambridge: Harvard University Press, 1985), Lehrer, K., *Theory of Knowledge* (Boulder: Westview Press, 1990) and Thagard, P, *Coherence in Thought and Action* (Cambridge: MIT Press, 2000).

bogged down in the debate about the particular details of coherentism here and we can simply adopt a basic, largely unanalyzed and broadly intuitive conception of coherence for the purposes of this paper. This is also desirable because the results here are then not dependent on any particular version of coherence theory and so we shall simply accept that a belief state is coherent to the degree that its elements fit together and are mutually supportive. Once we accept this interpretation of RT and the notion of a belief state on which it is based, there is a natural way to extend RT to cases of comparative acceptance for conditionals in general and for Bizet/Verdi cases in particular.

First, it is important to note that it is not at all clear that on RT either BV1 or BV2 is acceptable. This is because the minimal change of belief needed to incorporate the claim that Bizet and Verdi are compatriots does not obviously *require* accepting either that Bizet would have been Italian or that Verdi would have been French. But, both BV1 and BV2 seem to be acceptable conditionals nonetheless because accepting the shared antecedent permits one to accept either that Bizet would have been Italian or that Verdi would have been French. What is most important to recognize in the case of BV1 and BV2 is that they compete in an important sense. We then need to introduce the appropriate concept of a competitor as it applies to counterfactual conditionals. For the purpose of this paper we can simply adopt the following concept of the competition of conditionals:

(COMP) A counterfactual conditional A > C competes with all other counterfactual conditionals that have A as an antecedent.

So, in the case of the Bizet/Verdi conditionals, we have a case of two competing conditionals and this should be no surprise. As we have already seen there is something important about the relationship between those two conditionals that ties them together intimately. Given COMP we can then replace RT with an appropriate concept of comparative acceptance given the coherentist interpretation of belief states as follows:

> (CCA) Accept a sentence A > C in the state of belief K rather than A > B if and only if the minimal change of K needed to accept A, K', permits accepting C, the minimal change of K needed to accept A, K", also permits accepting B and the changes necessary to maintain the coherence of K' are less extensive than those necessary to maintain the coherence of K".

So defined, the principle of comparative conditional acceptance allows us to introduce a differential notion of conditional acceptance that is normative because it is based on the coherence theory of justification. Moreover, it allows us to explain Bizet/Verdi cases *without* having to introduce vagueness into the semantics for those conditionals.[22]

So why are our two conditionals so problematic and how does CCA make sense of the apparently problematic nature of them? Recall the Bizet/Verdi conditionals:

> (BV1) If Bizet and Verdi had been compatriots, Bizet would have been Italian.

> (BV2) If Bizet and Verdi had been compatriots, Verdi would have been French.

By COMP, BV1 and BV2 are competing counterfactual conditionals. Now if we apply CCA to our dual of sentences we should see that the revision of our state of belief K by the addition of

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[22] The reliability of semantic intuitions has recently been questioned in Machery, E., R. Mallon, S. Nichols and S. Stich, "Semantics, Cross-cultural Style," *Cognition* 92 (2004): B1-B12.

the shared antecedent of BV1 and BV2 permits the acceptance both of the claim that (I) Bizet would have been Italian and it also permits the acceptance of the claim that (F) Verdi would have been French.[23] This can be made more apparent by comparing the case of BV1 and BV2 with the cases where BV1 and BV2 are compared in terms of CCA with the following conditional:

(BV3) If Bizet and Verdi had been compatriots, Bizet would have been Dutch.

The changes necessary to accept BV3 are clearly more extensive than those needed to maintain consistency given the acceptance of BV1 or BV2. Moreover, given the relevant parts of our belief state and our intuitive understanding of coherence it also reasonable to suppose that the revision of K by I, K', and the revision of K by F, K", are *equally extensive*. Both resultant belief states hang together or are mutually supportive to the same degree—or to a very similar degree—given what we know about Bizet, Verdi and the world in general and the degree of change necessary to incorporate the antecedent and consequent of both is not noticeably different. It is just as coherent and requires the same sorts of changes of the same degree to suppose that, if the two men were compatriots, Bizet would be French as it is to suppose that, if the two men were compatriots, Verdi would be Italian. But the changes necessary to pursue either of these options in a coherent manner are clearly less extensive than the changes necessary to entertain the supposition that if the two men were compatriots, Bizet (or Verdi) would have been Dutch. Importantly, this means that while both BV1 and BV2 are acceptable there is no reason to accept BV1 over BV2 and no reason to accept BV2 over BV1 as per CCA. This then straightforwardly *explains* our inability to determine which is true and it explains this without

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[23]This can be seen also in that both BV1and BV2 satisfy RT.

any appeal to semantic vagueness. We do not need to take Stalnaker's radical semantic steps in order to deal with these sorts of cases. If the theory belief revision theory of counterfactual acceptance presented here is even broadly correct, then that the Bizet/Verdi cases are odd may well just be a reflection of a purely epistemic phenomenon and nothing deeper. This recognition in turn then shows that the Bizet/Verdi type cases do not decide the issue of CEM one way or the other. The *metaphysical/semantic* matter about of whether there can be ties in terms of the similarities of worlds is not decided simply because we cannot *epistemically* distinguish conditionals in Bizet/Verdi type cases, and in deference to the principle of minimal mutilation we ought to resist the move to introduce vagueness into the semantics of conditionals *pace* Stalnaker.

The foregoing theoretical considerations can be supplemented by empirical evidence concerning our shared practices of asserting and evaluating counterfactual conditionals. To this end, we undertook four empirical studies of folk judgments about counterfactuals and CEM, which we describe in the following sections. We observed that non-experts' intuitive judgments about Bizet/Verdi-style counterfactuals and CEM strongly accord with the belief revision view but not the Lewisian or Stalnakerian views. Together, we maintain that the theoretical and empirical considerations we adduce provide reason for preferring the belief revision over its competitors.

3. Study 1

In Study 1, we presented 150 participants (34% female, average age = 34, predominantly Caucasian, 97% native English speakers, all located in the U.S.) who were recruited via Amazon's Mechanical Turk (www.mturk.com) with the following vignette[24]:

> *Neighbors*. Joe is a Minnesotan who has always lived in Minneapolis, Minnesota, and Jane is a New Yorker who has always lived in Buffalo, New York. Since they have always lived in different states, they have never lived in the same neighborhood. They have never met or talked to one another. They don't even know about the existence of the other.

Participants were randomly separated into two conditions and were asked to think about two different kinds of Bizet/Verdi-style counterfactuals concerning Joe and Jane. Those in the 'were/would be' condition received the following instructions:

> Now think about what would be true if Joe and Jane were neighbors. Please read each of the following statements and select the best description of each statement that follows.
>
> (1.1) If Joe and Jane were neighbors, then Joe would be a New Yorker.
>
> (1.2) If Joe and Jane were neighbors, then Jane would be a Minnesotan.
>
> (1.3) If Joe and Jane were neighbors, then Jane would be a Texan.

The order in which these statements were presented was counterbalanced.

Statements (1.1) and (1.2) are Bizet/Verdi-style counterfactuals, since there does not seem to be any reason to suppose that the closest worlds where Joe and Jane are neighbors are

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[24] Workers in all studies were required to have an approval rating of at least 98% on at least 5000 Mturk tasks. No worker was permitted to participate in more than one condition or more than one study. Workers were paid $.35 for their participants in Study 1.

worlds where Joe is a New Yorker rather than worlds where Jane is a Minnesotan (or vice versa). Statement (1.3) was included for the sake of comparison, since it is clear that there are many worlds closer to the actual one in which Joe and Jane are not Texans.

After each statement, participants were given the following answer choices:

__ I think this statement is true.

__ I think this statement is false.

__ I think this statement is both true and false at the same time.

__ I think this statement is neither true nor false.

__ I think this statement is either true or false. I just don't know which one it is.

After each set of answer choices, participants were prompted to explain why they chose the answer they did.

Participants in the 'had been/would have been' condition received the following instructions:

Now think about what would be true if Joe and Jane had been neighbors. Please read each of the following statements and select the best description of each statement that follows.

(1.4) If Joe and Jane had been neighbors, then Joe would have been a New Yorker.

(1.5) If Joe and Jane had been neighbors, then Jane would have been a Minnesotan.

(1.6) If Joe and Jane had been neighbors, then Jane would have been a Texan.

Statement order was counterbalanced, and the answer choices were the same as above. Statements (1.4) and (1.5), like Statements (1.1) and (1.2), are Bizet/Verdi-style counterfactuals. Standard accounts of counterfactuals do not treat 'were/would be' counterfactuals differently

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than 'had been/would have been' counterfactuals. However, because we did not want to presume in advance that folk judgments about the two kinds of counterfactuals would be the same, we wanted to make both kinds of counterfactuals available to participants.

We did not expect participants to select 'I think this statement is true' very often for any of the Bizet/Verdi-style counterfactuals, since the vignette provides no reason for preferring any one of them to its counterpart. We also did not expect participants to endorse 'I think this statement is both true and false at the same time,' since we did not expect dialetheism to be common among the folk (at least in the present context). If participants were to make judgments in line with the Lewisian perspective, they should select 'I think this statement is false' for each of the Bizet/Verdi-style counterfactuals. The response 'I think this statement is neither true nor false' operationalized the Stalnakerian perspective in the present study. The belief revision option was represented by 'I think this statement is either true or false. I just don't know which one it is.'

We hypothesized that participants would choose the belief revision option more often than the others for Bizet/Verdi-style counterfactuals. Participant responses are summarized in Table 1.

	True	False	Both T & F	Neither T nor F	Either T or F
Statement 1.1	8%	24%	26%	14%	28%
Statement 1.2	15%	24%	21%	16%	24%
Statement 1.3	3%	76%	3%	5%	13%
Statement 1.4	12%	15%	28%	18%	27%
Statement 1.5	13%	15%	28%	15%	29%
Statement 1.6	1%	81%	1%	9%	7%

Table 1. Distributions of participant response choices for Statements 1.1 through 1.6 in Study 1, with the most commonly selected response for each question highlighted.

In regard to Statements 1.1, 1.2, 1.4, and 1.5—the Bizet/Verdi-style counterfactuals—three out of four times the most commonly selected response was 'I think this statement is either true or false. I just don't know which one it is.' A sizable number of participants also selected 'I think this statement is both true and false at the same time' for these statements. As expected, participants overwhelmingly chose 'I think this statement is false' for Statements (1.3) and (1.6).

In order to see whether participants treated the 'were/would be' counterfactuals and the 'had been/would have been' counterfactuals differently, we ran three chi-square tests of independence on participants' answers to Statements (1.1) and (1.4), (1.2) and (1.5), and (1.3) and (1.6). In each case, we observed no statistically significant difference in the distribution of participants' answer choices.[25] Thus, in what follows, we do not draw any important distinctions between 'were/would be' counterfactuals and their 'had been/would have been' counterparts.

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[25] (1) and (4): χ^2 (4, $N = 146$) = 2.350, $p = .672$. (2) and (5): χ^2 (4, $N = 150$) = 2.856, $p = .582$. (3) and (6): χ^2 (4, $N = 149$) = 3.222, $p = .521$.

Participants selected 'I think this statement is true' in response to the Bizet/Verdi-style counterfactuals 12% of the time. The Lewis, Stalnaker, and belief revision perspectives all agree that this is an incorrect response to give. Interestingly, of those participants who provided explanations for why they chose this answer, it was most often the case that participants explain they are not actually fully committed to these statements being true. In 64% of these explanations, participants said that they were thinking there must be in reality some fact that breaks the tie between the closest possible worlds. The following explanations are typical of this kind of response:

Since Jane is from NY, any neighbor of hers theoretically must be a New Yorker. So this would be true. [Statement 1.4]

Joe has always lived in Minnesota, so for a neighbor to be actually a neighbor, that person would be a Minnesotan. This includes Jane. [Statement 1.5]

It may be that instead of only partially processing the relevant information provided in the vignettes, these participants may be pushing back against the idea that there can be ties in terms of the closeness of possible worlds.

15% of the explanations for why 'I think this statement is true' was selected in response to the Bizet/Verdi-style counterfactuals employed modal terms to suggest there might not ultimately be a tie between the closest relevant possible worlds. For example:

Jane is from New York so it is possible for them to live there. [Statement 1.1]

Joe is from Minnesota so it is possible for them to live there. [Statement 1.2]

In other words, these explanations reveal that these participants meant 'I think it is possible that this statement is true.' These explanations suggest that if more were known about the situations in question, there would likely not be a tie in the closest possible worlds and it would be clear whether they were true or false.[26]

Participants selected 'I think this statement is false' 19% of the time in response to the Bizet/Verdi-style counterfactuals. According to Lewis, this is the correct response. According to Stalnaker and the belief revision perspective, it is not. However, many of the explanations for why participants selected this answer treated 'New Yorker' or 'Minnesotan' as terms of personal identity rather than as terms that denoted where someone lived:

Even if Joe lived in New York, he would be a Minnesotan since he was from there. [Statement 1.1]

No matter what state [Jane] moves to now, she would still be considered a New Yorker. [Statement 1.5]

14% of participants' explanations for why they selected this answer choice unambiguously treated 'New Yorker' and 'Minnesotan' in this fashion. These interpretations of the terms 'New Yorker' and 'Minnesotan' significantly diverge from how we intended them to be understood. In subsequent studies, we made sure to use terms that could not be misinterpreted in this way. When we subtract those responses that were clearly based upon a misinterpretation of 'New Yorker' or 'Minnesotan,' we see that participants expressed agreement with the Lewisian perspective at most 16% of the time.

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[26] The remaining 21% of explanations did not provide a clear rationale for why 'I think this statement is true' was chosen. These explanations include 'They would be in the same state' [Statement 1.1] and 'Because Joe and Jane were neighbors' [Statement 1.5].

46% of the explanations for why 'I think this statement is false' was chosen in response to the Bizet/Verdi-style counterfactuals appealed in some way to the fact that the information provided in the Neighbor vignette does not provide any reason for thinking these statements are true. Since it is specified that Joe has always lived in Minnesota, these participants did not see how the consequents of (1.1) and (1.4)—viz., "Joe would be a New Yorker" and "Joe would have been a New Yorker"—could be true. An additional 18% of explanations were an ambiguous combination of the first two kinds of explanation—meaning that the true percentage of participants who actually agree with Lewis is probably lower than the estimate given above.[27]

Participants selected the answer 'I think this statement is both true and false at the same time' 26% of the time in response to the Bizet/Verdi-style counterfactuals. An analysis of the explanations of their reasons for selecting this answer reveals that 0% of the participants who chose this response actually think the counterfactuals are literally both true and false at the same time. Instead, 87% of these participants clearly and unambiguously explained that they chose this answer because of the way it depicted a tie between the considerations in favor of saying the counterfactual in question was true and saying it was false[28]:

It's possible that Joe could be a New Yorker this way, but it's just as possible they could have both been neighbors in Minnesota instead. [Statement 1.1]

This statement could be true and false at the same time because it depends on if they were neighbors in New York or Minnesota. [Statement 1.1]

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[27] The remaining 5% of explanations were insufficiently clear to permit confident categorizations.
[28] 4% of participants interpreted 'New Yorker' and 'Minnesotan' as identity terms. The remaining 9% of responses were not sufficiently clear to be able to place them in any category.

I have no info about where Joe is living at the time if they were neighbors. [Statement 1.1]

It could go either way; Joe lives in Minnesota, so Joe could also be a Minnesotan if Jane was his neighbor. Not enough info to know who must have moved. [Statement 1.4]

It really depends on who moved where to figure who is what. [Statement 1.5]

Almost every participant who selected 'I think this statement is both true and false at the same time' used modal terms to explain that they thought of this answer as expressing an equal possibility between truth and falsity—not that they thought the statement in question was actually both true and false at the same time. Thus, it seems that all of the participants who selected this third answer endorse either the Stalnakerian view that the facts of the case are such that it is indeterminate whether the Bizet/Verdi-style counterfactuals are true or false or the belief revision view that there is a fact of the matter about which we are ignorant. Participants' answers strongly suggest they disagree with the Lewisian view that such counterfactuals are false.

Participants selected 'I think this statement is neither true nor false' 15% of the time in response to the Bizet/Verdi-style counterfactuals. Almost every explanation participants provided for their answer choices focused on the fact that there was no way for them to know whether Joe would be a New Yorker or then Jane would be a Minnesotan, if Joe and Jane were neighbors:

I don't have enough information to make a determination on whether this statement is true or false. [Statement 1.1]

Could have lived in either state, neighbors where isn't specified. [Statement 1.1]

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This hypothetical doesn't suggest where the two might live if they were neighbors. [Statement 1.4]

The most natural way to read all of the explanations participants provided of why they selected this answer choice is to see them as making epistemological points. It is not that they literally think the counterfactuals lack truth values and are actually neither true nor false. Rather, it is that they do not possess any reason for thinking the statements have one truth value rather than another. However, the idea of a statement being neither true nor false might be a rather difficult thing for an Mturk worker to express even if they wanted to endorse such a view. Therefore, in subsequent studies described below, we attempted to make it easier for participants to express such an idea.

Participants selected 'I think this statement is either true or false. I just don't know which one it is' 27% of the time in response to the Bizet/Verdi-style counterfactuals. The explanations they gave were entirely uniform and seemed to express a commitment to the idea that whatever facts made Joe and Jane neighbors would also make both of them New Yorkers or both of them Minnesotans. The participants simply noted that they were not privy to any information about those facts:

There's a lack of information. If they had been neighbors either Joe has been a New Yorker or Jane has been a Minnesotan. [Statement 1.1]

It would have depend on how they ended up being neighbors. [Statement 1.2]

There are two scenarios where they can be neighbors. They can be neighbors in either Minnesota, thus making Jane a Minnesotan or they can be neighbors in New York.

Therefore, the statement is true when they are neighbors in Minnesota, but not when they

are in New York. [Statement 1.5]

These responses seem to express something like the belief revision view, although as we noted

above it could difficult for participants to articulate a view like Stalnaker's even if they wanted

to.

The most direct and natural interpretation of the results from Study 1 is that participants'

judgments on the whole express something much closer to the belief revision account of

counterfactuals than either of the other views we considered above. Participants' judgments thus

provide us with no reason to reject CEM or to endorse supervaluationism for Bizet/Verdi-style

counterfactuals.

4. Study 2

In our second study of non-experts' judgments about Bizet/Verdi-style counterfactuals, we

constructed a vignette that had the same structural or logical features as Neighbor but that

avoided using terms like 'New Yorker' or 'Minnesotan' that could be interpreted as identity

terms. For Study 2, we recruited 75 workers (51% female, average age = 38, predominantly

Caucasian, 100% native English speakers, all located in the U.S.) from Amazon's Mechanical

Turk to read and respond to the following vignette:

Same Religion. Jordan is a devout Christian who was raised in a Christian household and

has practiced Christianity her entire adult life. Tenzin is a devout Buddhist who was

raised in a Buddhist household and has practiced Buddhism his entire adult life. Jordan

has never considered practicing Buddhism. Tenzin has never considered practicing Christianity.

Participants were given the following instructions:

Now think about what would be true if Jordan and Tenzin practiced the same religion. Please read each of the following statements and select the best description of each statement that follows.

(2.1) If Jordan and Tenzin practiced the same religion, then Jordan would be Buddhist.

(2.2) If Jordan and Tenzin practiced the same religion, then Tenzin would be Christian.

(2.3) If Jordan and Tenzin practiced the same religion, then Jordan would be Muslim.

Procedures and answer choices were the same as in Study 1. Participant responses are summarized in Table 2.

	True	**False**	**Both T & F**	**Neither T nor F**	**Either T or F**
Statement 2.1	10%	12%	21%	15%	42%
Statement 2.2	12%	12%	20%	15%	41%
Statement 2.3	3%	57%	8%	9%	23%

Table 2. Distributions of participant response choices for Statements 2.1 through 2.3 in Study 2, with the most commonly selected response for each question highlighted.

Participants strongly preferred the fifth answer choice, viz., 'I think this statement is either true or false. I just don't know which one it is.' We hypothesize that this difference in the distribution of responses observed in Studies 1 and 2 is due to the fact that in Study 2 it seemed

clearer to participants that one of the relevant states of affairs at issue (e.g., practicing Buddhism or being a New Yorker) precluded the other (e.g., practicing Christianity or living in Minnesota).

Participants' explanations for why they chose the answers they did were virtually identical to those observed in Study 1.[29] The few who selected 'I think this statement is true' often used modal terms to explain that they thought the statement could be true. Those who selected 'I think this statement is false' cited the lack of information in the vignette for thinking either of the statements are true. Participants who chose 'I think this statement is both true and false at the same time' said they did so because there was no reason to give one of the statements more credence than the other. And so on.

Again, the most straightforward interpretation of these results is that participants' judgments about Bizet/Verdi-style counterfactuals accord with the belief revision account of counterfactuals rather than the Lewisian or Stalnakerian accounts and thus provide no reason to reject CEM or to endorse supervaluationism.

5. Study 3

Studies 1 and 2 have certain features that might make them less than ideal probes of participants' intuitive judgments about Bizet/Verdi-style counterfactuals. One such feature is that the five answer choices participants were asked to choose from were not all uniform. Each of the first four options ('I think this statement is true,' 'I think this statement is false, 'I think this statement is both true and false at the same time,' and 'I think this statement is neither true nor false')

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[29] The only difference was that no participant in Study 2 interpreted any of the key terms as denoting personal identity.

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consists of a single sentence, whereas the fifth option ('I think this statement is either true or false. I just don't know which one it is') consists of two sentences. Furthermore, the second sentence contains the phrase 'I just don't know,' which might attract more uncertain participants to select this option than actually agreed with the semantic thesis stated in the initial sentence.

A second feature shared by Studies 1 and 2 is that, while the five answer choices they employ embodied different perspectives on Bizet/Verdi-style counterfactuals (and, by implication, CEM), they did not articulate any rationale one might have for selecting one of these options. Of course, participants were asked to explain their rationales. But we thought that providing them with different rationales to choose from might shed additional light on underlying factors driving their judgments.

A third feature is that the Neighbor and Same Religion vignettes feature pairs of counterfactual conditionals whose consequents are contrary to one another and do not exhaust the full range of possibilities. CEM, however, is stated in terms of a pair of conditionals in which the consequent of one is the negation of the consequent of the other. 'Joe would be a New Yorker' is not the negation of 'Jane would be a Minnesotan' (or vice versa). And one can reside somewhere besides New York or Minnesota. The same is true of being Buddhist and being Christian. Of course, 'Bizet would have been Italian' is not the negation of 'Verdi would have been French' either. And being Italian and being French do not exhaust all the nationality possibilities. So, we do not think it was out of bounds for us to use the conditionals we did. Furthermore, Lewis would say that each of the Bizet/Verdi-style counterfactuals we have considered above—viz., (BV1), (BV2), (1.1), (1.2), (1.4), (1.5), (2.1), and (2.2)—is false and

hence that CEM must be false as well. Thus, the Bizet/Verdi-style counterfactuals we employed have direct implications for the merits of CEM. Nonetheless, because the law of excluded middle is stated in terms of consequents that exhaust the full range of possibilities in which the antecedent is true, we wanted to see if we would obtain the same pattern of intuitive judgments with pairs of conditionals whose form more closely matched that of CEM.

Therefore, participants in Study 3 were asked to read the following vignette:

Hemisphere. Maddi lives in the northern hemisphere. She has lived there her entire life and has never even visited the southern hemisphere. Aleah lives in the southern hemisphere. She has lived there her entire life and has never even visited the northern hemisphere. Maddi has never considered moving to the southern hemisphere, and Aleah has never considered moving to the northern hemisphere.

Participants were then given the following instructions:

Now think about what would be true if Maddi and Aleah were to live in the same hemisphere. Which (if any) of the following statements would be true?

(3.1) If Maddi and Aleah were to live in the same hemisphere, then they would both live in the northern hemisphere.

(3.2) If Maddi and Aleah were to live in the same hemisphere, then they would both live in the southern hemisphere.

There are three main schools of thought about how to view statements like these:

View 1 says that one of these statements must be true and one of them must be false because there is always something that breaks apparent ties between statements like these

and makes one of them true and the other one false. This remains the case even when we can't tell what the tie-breaker is or which statement is the true one.

View 2 says that it is possible there is nothing that breaks the apparent tie between these statements and that if there is a genuine tie, both statements are false. Truth requires that the facts favor one of the statements over the other. But if the facts don't favor one statement over the other, they cannot be true. The only other option is for both of them to be false.

View 3 says that the facts of the case described above are not settled enough for the statements to be either true or false. Both truth and falsity require the facts to be settled in favor of one statement or the other. But when the facts are unsettled, there is nothing that makes the statements either true or false.

The order of presentation of Views 1 through 3 was counterbalanced across participants. View 1 corresponds to the belief revision account of counterfactuals and CEM, View 2 is Lewisian, and View 3 is Stalnakerian. In contrast to the Bizet/Verdi-style counterfactuals used in Studies 1 and 2, (3.1) and (3.2) feature consequents that exhaust the full range of possibilities. Instead of simply presenting participants with options like 'I think this statement is true,' 'I think this statement is false,' etc., with no accompanying rationale, the three views described above pair judgments about the truth values of (3.1) and (3.2) with explanations for those verdicts.

Participants were then asked the following seven comprehension questions. Correct answers are marked in bold.

(4.1) Maddi lives:

__ in the northern hemisphere

__ in the southern hemisphere

(4.2) Aleah lives:

__ in the northern hemisphere

__ in the southern hemisphere

(4.3) According to View 1, one of the statements (1) and (2) must be true.

True

False

(4.4) According to View 2, one of the statements (1) and (2) must be true.

True

False

(4.5) According to View 3, one of the statements (1) and (2) must be true.

True

False

(4.6) According to View 2, statements (1) and (2) are both false.

True

False

(4.7) According to View 3, statements (1) and (2) are both false.

True

False

Finally, participants were asked the following key questions:

(4.8) The view I find most plausible is:

       View 1

       View 2

       View 3

       I don't know

(4.9) Please explain your answer

150 participants (50% female, average age = 39, predominantly Caucasian, 99% native English speakers) were recruited via Amazon's Mechanical Turk to take part in Study 3. Their responses are summarized in Table 3.

	All Correct ($n = 79$)	Not all Correct ($n = 71$)	Total ($n = 150$)
Belief Revision	37%	32%	35%
Lewis	16%	20%	18%
Stalnaker	46%	34%	40%
Don't Know	1%	14%	7%

Table 3. Distributions of participant answers to Statements 4.8 in Study 3, organized by whether participants answered all seven comprehension questions correctly. The most commonly selected response in each column highlighted.

A chi-square test of independence revealed a statistically significant difference between the distribution of answers to (4.8) of those participants who answered all of the comprehension questions correctly and the distribution of those who did not.[30] As in Studies 1 and 2, participants exhibited a strong preference against the Lewisian view. Three quarters of participants selected

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[30] χ^2 (3, $N = 150$) = 10.095, $p = .018$, Cramér's V = .26.

either the belief revision or the Stalnakerian view, with a modest edge going to the Stalnakerian view.

When we examine participants' explanations for why they selected the answers they did, we find striking discontinuities in how participants understood the relevant views. The 52 participants who selected View 1 (the belief revision view) as the most plausible option offered basically identical explanations for their choice—explanations that clearly accord with the intended understanding of View1:

It just makes the most sense for one to be true and one to be false.

I feel that if they live in the same hemisphere, one of the two statements has to be true, though I cannot determine which one. There is no way that both of the statements is false because there are only two hemispheres. If they live in the same one, statement 1 or 2 has to be true because there is no other option.

One of them has to be true. If they are living in the same hemisphere it has to be one or the other.

The statement says that they both live in the same place, so one must be true, although there is no way to tell which one is true.

Even though I don't know which hemisphere they are together in, they have to be in one or the other.

However, matters were markedly different with the 60 participants who selected View 3 (the Stalnakerian view). 0% of them unambiguously expressed a commitment to the idea that

statements (3.1) and (3.2) lack truth values. Almost every explanation unambiguously articulated the idea that the choice between (3.1) and (3.2) was epistemically underdetermined:

I don't think we have all the information we need to correctly assess the situation.

There isn't enough information to confirm or deny either statement.

I don't know enough of the extenuating circumstances surrounding the girls to know what would happen, so they can be neither true nor false.

Because there are not of facts to prove one way or another.

There is not enough evidence to suggest either way and until the facts are settled, there is no way to predict.

I feel like in order for these statements to be true or false, more information would need to be given to base that answer off of. I don't think either is necessarily fully true or false.

We don't know that either of the two people mentioned would move to the location of the other. So, not enough information to determine.

Since we don't know which person would move, we can't say for sure which hemisphere they live in.

There isn't enough information to decide on the answer true or false.

Because there isn't enough info to know which is true and which is false

You can't establish truth or falsehood without the facts on which to base a conclusion.

I don't think either statement is necessarily true or false because there are no real facts that settle the argument.

> There is nothing stated that makes me believe and come to the conclusion on which is true and which is false
>
> It can't be that both are false because you HAVE to live in a hemisphere. I there are factors that would settle the question.

These explanations employ epistemic terms like 'don't know,' 'information,' 'prove,' 'assess,' 'confirm,' 'deny,' 'determine,' 'say for sure,' 'decide,' 'establish truth or falsehood,' 'conclusion,' 'argument,' 'believe,' and 'settle the question.' View 3 (the Stalnakerian view) is supposed to be a view on which matters are unsettled in a semantic sense rather than in an epistemic sense—one where the facts of the case fail to make (3.1) and (3.2) true or false. On this view, not even god could know that (3.1) or (3.2) is true because there is no truth to be known. Yet participants who chose View 3 almost unanimously offered explanations in which the unsettled nature of the case was epistemic—one where there are facts but these facts remain unknown.

Thus, despite what the quantitative data from Question (4.8) initially suggest, the qualitative data from Question (4.9) point significantly undermine the conclusion that folk judgments about counterfactuals and CEM accord more with the Stalnakerian view than the belief revision view.

6. Study 4

To round out our studies of non-expert judgments about counterfactuals and CEM, in our final study we wanted to ask participants directly about a substitution instance of CEM that employed

Bizet/Verdi-style counterfactuals. After reading the Hemisphere vignette, participants were given the following instructions:

Now think about what would be true if Maddi and Aleah were to live in the same hemisphere. Please indicate the extent to which you agree or disagree with the following claim:

(3.3) If Maddi and Aleah were to live in the same hemisphere, then either they would both live in the northern hemisphere or they would both live in the southern hemisphere.

Please explain your answer.

Participants were asked to indicate their agreement or disagreement with (3.3) on a five-point scale that was labeled 'Strongly Disagree,' 'Disagree,' 'Neither Agree nor Disagree,' 'Agree,' and 'Strongly Agree.'

Participants were 75 workers from Amazon's Mechanical Turk (48% female, average age = 40, predominantly Caucasian, 100% native English speakers). 5% selected 'Strongly Disagree,' 8% selected 'Disagree,' 9% selected 'Neither Agree nor Disagree,' 21% selected 'Agree,' and 56% selected 'Strongly Agree.' Participants thus expressed very strong agreement with (3.3).

Participants' explanations for why they agreed or strongly agreed with (3.3) focused on its logically compelling nature:

It is simple logic, right? If they lived in the same hemisphere as each other, then it would have to either be the northern or the southern. Can't be both, and there are only two to choose from.

There are only two options for hemispheres, there is nothing in between.

They have to live in either one.

If they were in the same hemisphere, it would have to be one or the other.

It's a logical explanation. If they are to live in the same hemisphere then it's only logical they're indeed in the same hemisphere.

There's only 2 options and they both have to live in one of them so it's accurate.

The few participants who disagreed with (3.3) highlighted the fact that 'same hemisphere' is technically ambiguous and could refer not just to the northern and southern hemispheres but to the eastern and western ones as well:

From the context of the story the "same hemisphere" might imply either the northern or southern if that's what the person presenting it meant, but there are also eastern and western hemispheres, so the two could both be in the western hemisphere while being in different north/south hemispheres. It's unclear from context whether that's a valid "solution" to the problem.

There are four hemispheres so not only could they either live in the northern or southern hemisphere, but they could also live in the eastern or western hemisphere.

They could live in the eastern or western hemispheres as well.

Just enough logical acumen to be a danger to themselves and others.

Participants in Study 4 thus overwhelmingly endorsed a substitution instance of CEM that featured a conjunction of Bizet/Verdi-style counterfactuals.

7. Conclusion

In this chapter we considered the relevant details of three philosophical perspectives on the nature of counterfactual conditionals, particularly as they apply to Bizet/Verdi cases. Importantly, this includes the perspectives of both Stalnaker and Lewis. We examined in some detail their views on the question of whether and how the principle of conditional excluded middle figures in the logic and semantics of counterfactuals. Following this expository project, we articulated and defend a third view based on belief revision theories in the tradition of the Ramsey Test. Unlike Lewis' view, the belief revision perspective does not reject conditional excluded middle and does not treat such competing conditionals as false. Unlike Stalnaker's view it does not embrace supervaluationism and treat such competing conditionals as indeterminate in truth value. On this basis we adduced what we thing are compelling theoretical reasons in favor of the belief revision view. However, we also reported of the results of four empirical studies of non-experts' judgments about counterfactuals and conditional excluded middle that provide strong additional empirical support for the belief revision view. We conclude then that it is likely the seeming difficulties associated with Bizet/Verdi cases are merely epistemic and it is thus unlikely that they are driven by deeper semantic considerations.