

# 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's 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 Stalnaker's and Lewis's views. The empirical considerations are drawn from the results of three empirical studies ( $N = 525$ ) of nonexperts' judgments about counterfactuals and conditional excluded middle.

## 1 Introduction<sup>1</sup>

At least since W. V. Quine introduced the Bizet/Verdi case in 1950 there has been significant controversy 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) (Quine, 1950). Conditional excluded middle is usually 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 a statement and its negation, at least one of the conditionals

must be true. CEM is a consequence of what Daniel Bonevac calls “Stalnaker’s rule” (Bonevac, 2003). This is stated as follows:

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

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 (Stalnaker, 1981). In point of fact, he advocated doing this via the use of the theory of supervaluations that had previously been developed by Bas van Fraassen (Van Fraassen, 1966). The result is a semantic theory that allows conditionals in Stalnaker’s logic to be true, false, or indeterminate. Lewis also acknowledged the need for vagueness in the semantics for counterfactuals, but he rejected CEM (Lewis, 1973).<sup>2</sup>

The main reasons why Stalnaker 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 and that we should not attempt to settle the issue of how to deal with such cases on the basis of intuitions about CEM (Shaffer, 2016). In this chapter, we test Stalnaker’s and Lewis’s 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 three mixed method 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 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 regarding 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 (Stalnaker, 1968). 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:

$$(C1) A > B \text{ is true at world } i, \text{ if and only if, } B \text{ is true at } f(A, i).$$

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

Alternatively, Lewis’s semantics for counterfactuals was presented in terms of a comparative similarity relation (Lewis, 1973). 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:

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

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 (Stalnaker, 1981). Nevertheless, the two theories of counterfactuals that arise from these semantic bases and the constraints imposed on them are not strictly equivalent. The crucial point where the theories differ is that Stalnaker's theory assumes what Lewis called the limit and uniqueness assumptions. On the basis of these assumptions, Stalnaker endorses CEM. Lewis, however, disagrees and rejects the limit assumption and CEM. The details of the limit assumption are not important here, but acceptance of it and the uniqueness assumption is what gives rise to the problems associated with CEM noted above.<sup>3</sup> 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 (Stalnaker, 1981: 89). Moreover, he defends this view on the basis of his own personal "unreflective linguistic intuition" (Stalnaker, 1981: 92) and argues essentially that treating both of the Bizet/Verdi counterfactuals as indeterminate in truth value better reflects these semantic intuitions than Lewis's 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 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 Makinson developed the AGM theory of belief revision in the 1980s and a number of related theories have arisen as a consequence (Alchourrón et al., 1985; Gärdenfors, 1988; Levi, 1996). The theory developed here will be 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.

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 subdivided 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 are *expansions*, and those that do are *revisions*.<sup>4</sup> 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 should be retained 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 chapter 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 (Gärdenfors, 1981, 1982, 1988). The core concept of this theory is the Ramsey Test (Ramsey, 1929)<sup>5</sup>:

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.<sup>11</sup>

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 pair of sentences we should see that the revision of our state of belief  $K$  by the addition of the shared antecedent of BV1 and BV2 permits the acceptance 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.<sup>12</sup> 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 is 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

(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  $C$ .<sup>6</sup>

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.<sup>7</sup> This view is typically framed in terms of a version of the epistemological coherence theory of justification and this seems natural given BS.<sup>8</sup> 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 versions of coherence theory that are plausible views of justification.<sup>9</sup> The most famous are of course those of Laurence Bonjour and Keith Lehrer, but Paul Thagard's and Ted Poston's versions are also well regarded and more recent versions of coherentism (see Bonjour, 1985; Lehrer, 1990; Thagard, 2000; Poston, 2014). In any case, we need not get 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 chapter. 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.<sup>10</sup>

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 chapter 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.

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 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 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 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 three empirical studies of folk judgments about counterfactuals and CEM, which we describe in the following sections. Collecting both quantitative and qualitative data, we found that nonexperts' intuitive judgments about Bizet/Verdi-style counterfactuals and CEM accord better with the belief revision view than with the Lewisian or Stalnakerian views. We do not believe that data about folk judgments can be decisive in debates like the present one or that they should trump more theoretical considerations. Nevertheless, we believe the data we report below represent an important kind of consideration for theorists to take into account—particularly since the target of investigation is the ordinary meaning of an everyday use of language. Together, we maintain that the theoretical and

empirical considerations we adduce provide reason for preferring the belief revision view over the Lewisian and Stalnakerian views.

### 3 Study 1

In Study 1, we presented 150 participants (34 percent female, average age = 34, predominantly Caucasian, 97 percent native English speakers, all located in the United States) who were recruited via Amazon's Mechanical Turk ([www.mturk.com](http://www.mturk.com)) with the following vignette<sup>13</sup>:

*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 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 (always in the following order):

— 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. All of the above questions (in addition to demographic questions) were presented on a single webpage.

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 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. 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."

**Table 11.1** Distributions of participant response choices for Statements 1.1 through 1.6 in Study 1, with the most commonly selected responses highlighted

	Both		Neither		Either	
	True (%)	False (%)	T & F (%)	T nor F (%)	T or F (%)	T or F (%)
Statement 1.1	8.3	23.6	26.4	13.9	27.8	27.8
Statement 1.2	14.7	24.0	21.3	16.0	24.0	24.0
Statement 1.3	2.7	76.0	2.7	5.3	13.3	13.3
Statement 1.4	12.2	14.9	28.4	17.6	27.0	27.0
Statement 1.5	13.3	14.7	28.0	14.7	29.3	29.3
Statement 1.6	1.4	81.1	1.4	9.5	6.8	6.8

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 11.1, with the most commonly selected responses for each question highlighted.<sup>14</sup>

Chi-squared goodness-of-fit tests were performed on participants' responses to each statement in order to see if each distribution of answer choices differed significantly from chance. The tests were significant for Statements (1.1), (1.3), and (1.6) and approached significance for (1.5).<sup>15</sup> 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.<sup>16</sup> Thus, in what follows, we do not draw any important distinctions between "were/would be" counterfactuals and their "had been/would have been" counterparts.

Participants overwhelmingly responded to Statements (1.3) and (1.6) by giving the intuitively correct verdict "False." Because the three theoretical perspectives under consideration do not differ in regard to the correct response to these counterfactuals, we set these data aside for now. Collapsing data across the "were/would be" and the "had been/would have been" conditions, we find that in response to Statements (1.1), (1.2), (1.4), and (1.5), participants gave the Lewisian answer ("False") 19.3 percent ( $\pm 4.5$  percent) of the time, the Stalnakerian answer ("Neither") 15.5 percent ( $\pm 4.1$  percent) of the time, and the belief revision response 27.0 percent ( $\pm 5.1$  percent) of the time.<sup>17</sup>

Participants selected "I think this statement is true" in response to the Bizet/Verdi-style counterfactuals 12.2 percent 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 percent 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]

Fifteen percent 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.<sup>18</sup>

Several of the 19.2 percent of participants who selected the Lewisian answer ("False") in response to the Bizet/Verdi-style counterfactuals indicated in their explanations that they selected this answer because they 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]

Fourteen percent 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 percent of the time.

Forty-six percent 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 percent 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.<sup>19</sup>

Participants selected the answer "I think this statement is both true and false at the same time" 26.0 percent 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 percent of the participants who chose this response actually think the counterfactuals are literally both true and false at the same time. Instead, 87 percent 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<sup>20</sup>:

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]

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" 15.5 percent 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 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]

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 M-Turk 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" 27.0 percent 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 to 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 be difficult for participants to articulate a view like Stalnaker's even if they wanted to.

The most direct and natural interpretation of the quantitative and qualitative data from Study 1 is that participants' judgments on the whole express something 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 supervenientism for Bizet/Verdi-style counterfactuals.

## 4 Study 2

In our second study of nonexperts' 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 seventy-five workers (51 percent female, average age = 38, predominantly Caucasian, 100 percent native English speakers, all located in the United States) from Amazon's Mechanical Turk<sup>21</sup> 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 11.2.

Chi-squared goodness-of-fit tests were performed on participants' responses to each question in order to see if each distribution of answer choices differed significantly from chance. Each test was significant.<sup>22</sup> In other words, the distributions of participant answer choices differed significantly from a (flat) distribution in which each answer choice was chosen equally often. Participants selected the Lewisian response 12.2 percent ( $\pm 5.3$  percent) of the time, the Stalnakerian view 15.0 percent ( $\pm 5.8$  percent) of the time, and the belief revision view 41.5 percent ( $\pm 8.0$  percent) of the time.

For both of the Bizet/Verdi-style counterfactuals, 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.<sup>23</sup> 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.

**Table 11.2** 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

	True (%)	False (%)	Both		Neither		Either	
			T & F (%)	T or F (%)	T nor F (%)	T or F (%)		
<b>Statement 2.1</b>	10	12	21	15	15	42		
<b>Statement 2.2</b>	12	12	20	15	15	41		
<b>Statement 2.3</b>	3	57	8	9	9	23		

Again, the most straightforward interpretation of these quantitative and qualitative data is that participants' judgments about Bizet/Verdi-style counterfactuals accord with the belief revision account of counterfactuals better 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") 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

All of the above questions (in addition to demographic questions) were presented on a single webpage.

Three hundred participants (46 percent female, average age = 38, predominantly Caucasian, 99 percent native English speakers) were recruited via Amazon's Mechanical Turk to take part in Study 3.<sup>24</sup> Their responses are summarized in Table 11.3.

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.<sup>25</sup> The primary driver of this difference was that fewer participants who answered all comprehension questions correctly selected "I don't know" than those who did not. As in Studies 1 and 2, participants exhibited a marked preference against the Lewinian view. Three quarters of participants selected 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 102 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 View 1:

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 121 participants who selected View 3 (the Stalnakerian view). Only 2.5 percent 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 undetermined:

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.

**Table 11.3** 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 responses in each column are highlighted

	All correct ( <i>n</i> = 151) (%)	Not all correct ( <i>n</i> = 149) (%)	Total ( <i>n</i> = 300) (%)
<b>Belief Revision</b>	33.8 (±7.5)	34.2 (±7.6)	34.0 (±5.4)
<b>Lewis</b>	16.6 (±5.9)	16.8 (±6.0)	16.7 (±4.2)
<b>Stalnaker</b>	47.0 (±8.0)	33.6 (±7.6)	40.3 (±5.6)
<b>Don't Know</b>	2.6 (±2.5)	15.4 (±5.8)	9.0 (±3.2)

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) significantly undermine the conclusion that folk judgments about counterfactuals and CEM accord more with the Stalnakerian view than the belief revision view.

## 6 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 defended a third view based on belief revision theories in the tradition of the Ramsey Test. Unlike Lewis's 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 supervenience and treat such competing conditionals as indeterminate in truth value. On this basis we adduced what we think are compelling theoretical reasons in favor of the belief revision view. However, we also reported the results of three empirical studies of nonexperts' judgments about counterfactuals and conditional excluded middle that provide 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 thus unlikely that they are driven by deeper semantic considerations.

## Notes

- 1 The exposition in the opening sections of this chapter closely follows Shaffer (2016).
- 2 Lewis also effectively appeals to the supervaluational theory, but he disagreed with Stalnaker about CEM and its basis in the possible world's framework.
- 3 See (Cross, 2009) for discussion of the relationship between the limit assumption, the uniqueness assumption, and the principle of counterfactual consistency.
- 4 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.
- 5 See (Shaffer, 2011, 2013) for some discussions of problems for naive formulations of the Ramsey Test.
- 6 For a relatively recent discussion of RT and related views, see (Levi, 2004).
- 7 (Sanford, 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 conditionals 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 (Williamson, 2007: chapters 5 and 6) for discussion of one suggestion for how such knowledge might be obtained.
- 8 See (Gärdenfors, 1992) for the most thorough defense of the AGM theory in terms of coherentism. See (Shaffer, 2002) for some worries about this view.
- 9 There is of course some controversy about such views, especially those that are framed in terms of probabilistic notions of coherence. See (Bovens and Hartmann, 2003; Olsson, 2005) for discussion of this matter.
- 10 We acknowledge here both that our invocation of AGM-type theories as a basis for an epistemic theory of conditional acceptance is not wholly worked out here and that it is potentially problematic. Gärdenfors himself pointed out in (Gärdenfors, 1986) and in (Gärdenfors, 1988: chapter six) that the AGM models for conditional acceptance are trivial. But, we think that the general approach is sound, as does Gärdenfors himself (1988: 166).

- 11 The reliability of semantic intuitions has recently been questioned in (Machinery et al., 2004).
- 12 This can be seen also in that both BV1 and BV2 satisfy RT.
- 13 Workers were required to have an approval rating of at least 98 percent on at least 5000 M-Turk 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.
- 14 Complete data sets from each of our studies can be found here: <https://osf.io/a5jty/>.
- 15 (1.1):  $\chi^2(4, N = 72) = 10.36, p = .035$ . (1.2):  $\chi^2(4, N = 75) = 2.93, p = .57$ . (1.3):  $\chi^2(4, N = 75) = 149.87, p < .001$ . (1.4):  $\chi^2(4, N = 74) = 7.89, p = .096$ . (1.5):  $\chi^2(4, N = 75) = 9.47, p = .050$ . (1.6):  $\chi^2(4, N = 74) = 174.38, p < .001$ .
- 16 (1.1) & (1.4):  $\chi^2(4, N = 146) = 2.35, p = .672$ . (1.2) & (1.5):  $\chi^2(4, N = 150) = 2.86, p = .582$ . (1.3) & (1.6):  $\chi^2(4, N = 149) = 3.22, p = .521$ .
- 17 The percentages in parentheses represent 95 percent confidence intervals.
- 18 The remaining 21 percent 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].
- 19 The remaining 5 percent of explanations were insufficiently clear to permit confident categorizations.
- 20 Four percent of participants interpreted "New Yorker" and "Minnesotan" as identity terms. The remaining 9 percent of responses were not sufficiently clear to be able to place them in any category.
- 21 Workers were required to have an approval rating of at least 98 percent on at least 5000 M-Turk tasks. Workers were paid \$.35 for their participants in Study 2.
- 22 (2.1):  $\chi^2(4, N = 73) = 25.43, p < .001$ . (2.2):  $\chi^2(4, N = 74) = 21.14, p < .001$ . (2.3):  $\chi^2(4, N = 74) = 70.73, p < .001$ .
- 23 The only difference was that no participant in Study 2 interpreted any of the key terms as denoting personal identity.
- 24 Workers were required to have an approval rating of at least 98 percent on at least 5000 M-Turk tasks. Workers were paid \$.45 for their participants in Study 3.
- 25  $\chi^2(3, N = 300) = 17.00, p < .001$ , Cramér's  $V = .24$ .

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