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On a Supposed Criticism of Counterexample to Modus Ponens

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Abstract

More than two decades ago, Vann McGee presented an alleged counterexample to modus ponens (MP). Despite criticisms, it seems to have survived to date. In this paper, I will defend McGee's counterexample against the criticism by Bernard Katz, as a representative of a type of the defense of MP, which appeals to certain logical principles, or what I call the *logical defense of MP*[1]. I will argue that his way of criticizing McGee, and therefore of defending MP, actually begs the question. I will conclude that, the logical defense of MP in general will inevitably beg the question, and hence is doomed to fail. (This paper, together with my (2009), constitutes a part of my project on indicative conditionals, which is itself a part of the larger project on the theory of knowledge and belief change.)

Key words: Indicative Conditionals, Modus Ponens, McGee

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[1] In doing so, I will not appeal to the probabilistic model of the indicative conditionals, which has become popular in recent years. So let me first give some justification for the assumption and the approach here, which will also justify the significance of the present paper. As I show in my (2009), given the standard assumptions of the probabilistic analysis of indicatives, the failure of MP (or at least the validity of the law of exportation) will almost trivially follow, once we allow the iterated conditionals. (In fact, the failure of MP was already foreseen at the very beginning of this approach, on p.33 of Adams 1975). But it is trivial only while we assume the probabilistic approach, which, though popular, has not established the status of *the* approach to the analysis of indicative conditionals (over rival approaches). In particular, in the present context we cannot use a specific probabilistic model *to criticize Katz's argument*, since the very fact that it invalidates MP could rather count as a piece of evidence *against* that model, and if there is an independent good argument to the effect that MP in fact holds for indicatives unexceptionally, *so much the worse* for the probabilistic models (of iterated conditionals) in general, where Katz's paper claims to provide just such an argument. Probabilistic models of (compound) conditionals are something to be *justified by* the specific examples of the failure of MP, rather than *justify* the failure of MP. But if so, responding to Katz's argument without presupposing the probabilistic approach, and showing exactly *where* his argument went wrong, are not only meaningful, but *necessary* even for the proponents of this approach. Thus this project

Before the 1980 presidential election, the Republican candidate Ronald Reagan was ahead of the Democrat Jimmy Carter, according to opinion polls. But there was also a Republican candidate, John Anderson, who was a distant third. Given this information, it was reasonable to believe, at that time, the following premises:

(a) If a Republican wins the election, then if it's not Reagan who wins it will be Anderson,
(b) A Republican will win the election.

However, given what was known about Anderson, it was then *not* reasonable to believe the following:

(c) If it's not Reagan who wins, it will be Anderson.

This is because people rather believe that in that case Carter will win. But (c) is the conclusion of modus ponens (MP) applied to (a) and (b).

This is one of three examples that McGee presented as a counterexample to MP, in his (1985)[2,3]. Against this, Katz (1999) claims that the alleged counterexample demonstrates the failure of the *law of exportation*, rather than that of MP. The law of exportation is the principle that licenses the inference from a sentence of the form $\phi \wedge \psi \rightarrow \chi$ to the sentence of the form $\phi \rightarrow (\psi \rightarrow \chi)$[4], where "$\rightarrow$" stands for the connective of English indicatives (the converse of this rule is called the *law of importation*). In McGee's example, the inference in question is from

(a') If a Republican wins the election *and* it's not Reagan who wins, then it will be Anderson,

has significant meaning not only for those who want to defend MP by agreeing to Katz, but also for those many people who believe that indicatives should be given the probabilistic analysis.

2 This counterexample has since been criticized (Lowe 1987; Sinnot, Moore, and Fogelin 1986), but also welcomed (Lycan 1987) and defended (Piller 1996). In the following I will focus on Katz (1999) as the most recent explicit criticism, leaving the defense against other criticisms to Piller (1996).

3 Some people point out that Ernest Adams had mentioned similar counterexample to MP (Adams 1975, p.33). But I do not agree with Edgington (1995) when she mentions (p.282, n.47) McGee's counterexample as if it were just a variant of Adams's. Not only that Adams himself did not endorse the failure of MP, but his example was of the form; $\ulcorner A \rightarrow (B \rightarrow A) \urcorner$, A, but not $\ulcorner B \rightarrow A \urcorner$. McGee's was in this sense certainly more general, and more importantly, *concrete*, and that is why it convinced (if not all) people that the failure of MP is not a negligible anomaly but a general and legitimate feature of indicative conditionals. Also note that, concerning this particular example nothing hinges on the peculiarity of American election system. If the reader is skeptical about this, just refer to McGee's other two examples in his (1985).

4 Throughout this paper I will use Greek letters, ϕ, ψ, χ, etc. for sentence in general, and Roman letters, A, B, C, etc. for atomic sentence.

to

(a) If a Republican wins the election, then if it's not Reagan who wins it will be Anderson,

which seems plausible enough. Then let us see why Katz thinks that the law of exportation fails, and in particular why he thinks that McGee's example is a counterexample to it, rather than to MP.

To begin with, McGee's examples share the following form (where A, B, C are atomic):

(1) $A \rightarrow (B \rightarrow C)$ and
(2) A

hold, but *not*

(3) $B \rightarrow C$.

According to Katz, the intuitive force of McGee's counterexamples to MP depends on our acceptance of the law of exportation. He claims that, the first premise of McGee's counterexamples (of the form (1)), like (a), is, against our intuition, false[5], while, as Katz admits, the corresponding sentence of the form $A \wedge B \rightarrow C$, in this case (a'), is true, which therefore together constitute a counterexample to the law of exportation.

The reason he gives for the falsity of the instances of (1) is that in all such examples instances of (2) are regarded as true while those of (3) are regarded as false. According to him,

> [$\cdots$] it is easy to see that [the first premise of McGee's examples, of the form (1)] cannot be true. For it is an essential feature of any conditional, indicative or otherwise, that it is false if it has a true antecedent and false consequent. (p.412)

Let us call this principle C.

C: If the antecedent of a conditional is true and its consequent is false, then the conditional is false.

However, without any further argument assuming this principle just begs the question[6]. Surely people normally admit that any conditional of the form $\phi => \psi$ (in-

[5] In this paper I follow Katz in assuming the truth values for indicative conditionals. But I remain neutral as to whether they really have truth conditions, and I believe this issue does not affect the following argument. Those who think they lack truth values, therefore, may just substitute notions like acceptability (or Jacksonian *assertibility*) for the talk of truth values.

[6] In the following I will reveal how Katz's argument implicitly begs question against

dicative or otherwise) cannot be true when ϕ is true and ψ is false. But that is simply because they think that *otherwise MP would fail.* Anyone who is committed to the failure of MP is also committed to denying the principle C, that $\ulcorner\phi => \psi\urcorner$ (indicative or otherwise) is false whenever ϕ is true and ψ is false[7]. Note that this is not a suspicious generalization, but rather an (almost vacuous) *conceptual* claim about what amounts to denying MP. Accepting (rejecting) the principle C just *is* accepting (rejecting) that ψ is true whenever $\ulcorner\phi => \psi\urcorner$ and ϕ are both true, which is to accept (reject) MP[8].

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those who deny MP. But let us confirm here that even though, in discussing indicative conditionals, we mention people's beliefs, it does not mean that the truth values of indicatives depend on *facts about our beliefs*, which entails that in asserting an indicative conditional we are asserting some fact about our beliefs. If we think this way, then appealing to the fact that people in general assume MP, as Katz does here, would not beg any question. However, such a conception of indicatives will cause multiple problems. See for example sec.36 and 37 of Bennett 2003. We should better think that our beliefs constitute, or give substance to, the *truth-bearer* of indicatives, rather than the *truth-condition.*

[7] And indeed McGee's example is meant to be just such a case, where $\ulcorner\phi \rightarrow \psi\urcorner$ is true while ϕ is true and ψ is false. One might complain here that this makes the truth condition of $\ulcorner\phi \rightarrow \psi\urcorner$ utterly mysterious. But this may be just because, as many theorists think, indicative conditionals simply lack truth conditions. In this connection, even Bennett, who holds the non-truth value view of indicatives (NTV), admits that $\ulcorner\phi \rightarrow \psi\urcorner$ is false if ϕ is true and ψ is false (see sec.8 of his 2003). But the reason for his acceptance of the latter view is based on, again, his acceptance of MP. He says, "A conditional with a true antecedent and false consequent is a defective intellectual possession for anyone at any time: it is ripe for use in Modus Ponens because [in the case of $\ulcorner$A $\rightarrow$ C$\urcorner$] A is true, and if so used will lead to error because C is false" (p.114). Elsewhere (manuscript), I have argued that Bennett must also admit that MP (or what he calls *restricted* MP) fails for indicative conditionals, given his Adams-style probabilistic approach. In fact, McGee himself proposed a system that is a natural extension of Adams's system (which therefore lacks truth conditions) to cover compound conditionals (whose antecedents however do not contain further conditionals), in which, of course, MP is not valid. See McGee (1989).

[8] One of the referees of this journal pointed out that, in paraconsistent logic, even though $\phi \supset \psi, \phi \vdash \psi$ is not a valid inference, $(\phi \supset \psi) \wedge \phi \supset \psi$ is a theorem. Though independently interesting, this does not count as a counterexample to our present claim. MP is essentially an *inference rule*, and therefore what we are concerned with here is only the validity of the consequence relation $\phi \supset \psi, \phi \vdash \psi$, and not that of a *formula* $(\phi \supset \psi) \wedge \phi \supset \psi$. (By the way, I am not sure which system the referee mentions among numerous paraconsistent systems. For many systems both $\phi \supset \psi$, $\phi \vdash \psi$ and $\vdash (\phi \supset \psi) \wedge \phi \supset \psi$ fail, and for some systems e.g., filter logic, both do hold). Now $\phi \supset \psi, \phi \vdash \psi$ is not a valid inference in typical paraconsistent logic precisely because even if ϕ is true and ψ is false, $\ulcorner\sim \phi \vee \psi\urcorner$ (i.e. $\ulcorner\phi \supset \psi\urcorner$) may be true (and here $\ulcorner\sim \phi \vee \psi\urcorner$ may be true because *both* ϕ and $\ulcorner\sim \phi\urcorner$ can be true at the same time in paraconsistent logic). (As for $(\phi \supset \psi) \wedge \phi \supset \psi$, we should ask whether $\ulcorner(\phi \supset \psi) \wedge \phi \supset \psi\urcorner$ is false whenever $\ulcorner(\phi \supset \psi) \wedge \phi\urcorner$ is true and ψ is false. The answer is negative, for the analogous reason). This example therefore just confirms the above

Katz in fact gives (p.413) an argument for this principle applied to the above specific formulas ((1), (2), and (3)), but does it by appealing to the Ramsey test, a thesis that, roughly, the evaluation of a conditional sentence is to be equated with that of its consequent after hypothetically adding the antecedent to one's stock of beliefs (together with minimal adjustment of the belief system to preserve consistency)[9]. Katz argues that, given that we already believe A, that is, have A in our stock of beliefs, our evaluation of $\ulcorner A \rightarrow (B \rightarrow C)\urcorner$ will be exactly the same as that of $\ulcorner B \rightarrow C\urcorner$, and therefore these two cannot have different truth values (p.414).

Convincing as it may look, this argument doubly fails. For one thing, it is intuitively very plausible to think that any counterexample to MP is *ipso facto* a counterexample to the Ramsey test[10]. If so, however, appealing to the Ramsey test (thereby assuming the validity of it) in order to defend MP looks simply question-begging. (Though there may of course be some interpretations of the Ramsey test which is compatible with the failure of MP[11], that merely means that on such interpretations the Ramsey test alone cannot save MP). For another, the Ramsey test can be used to argue *for* the law of exportation[12]. Evaluating C after first adding A and *then* adding B to our stock of beliefs, is practically indistinguishable from evaluating C after adding A and B together, and therefore our evaluations of $\ulcorner A \rightarrow (B \rightarrow C)\urcorner$ and $\ulcorner A \wedge B \rightarrow C\urcorner$ cannot differ[13]. Then it is not clear how Katz can resist such an argument while he himself relies on the Ramsey test.

The problem of Katz's argument to the effect that the Ramsey test shows that $\ulcorner A \rightarrow (B \rightarrow C)\urcorner$ and $\ulcorner B \rightarrow C\urcorner$ have the same truth values, is that, he does not really

conceptual claim about the denial of MP. (Note also that here I simply follow Katz in assuming that conditionals have truth condition, and if the system is a many-valued logic, inferential validity is formulated in terms of preservation of *designated values*, rather than simple truth preservation, but even there the analogous result follows.)

9 The idea of the Ramsey test is originally due to Ramsey (1929).

10 If we know that ϕ is true but ψ is not, then the Ramsey test, intuitively understood in the way Katz does there, tells us that we should take $\ulcorner \phi \rightarrow \psi\urcorner$ to be false (or at least should not accept it). But if MP fails, $\ulcorner \phi \rightarrow \psi\urcorner$ can nevertheless be true. In such a case, the Ramsey test, on that informal understanding, should also be judged as invalid.

11 For example, Levi (1996) presents such an interpretation of the Ramsey test based on the AGM revision.

12 See for example, sec.40 of Bennett (2003).

13 Several "proofs" of the law of exportation (and importation) have been given in terms of the probabilistic approach, based on what is called Stalnaker's hypothesis, i.e., the equation $P(A \rightarrow C) = P\ (C/A)$ (where $P(A) > 0$). What such proofs do is, therefore, to establish; $P(A \rightarrow C/B) = P\ (C/A\&B)$ (where $P(A\&B) > 0$). See for Stalnaker's own proof, p.303 of his (1976), and see also one by Alan Hájek, presented in p.62 of Bennett (2003). Also, Arlo-Costa (2001) gives an extended observation that, the account of the conditionals based on his probabilistic approach to epistemology, or *probabilism*, is deeply committed to the export-import law.

use the Ramsey test in evaluating $\ulcorner A \rightarrow (B \rightarrow C)\urcorner$. According to his explanation, in evaluating $\ulcorner A \rightarrow (B \rightarrow C)\urcorner$, "since we already accept (2), our adjusted stock of beliefs will be exactly the same as our initial stock of beliefs" (p.414). True, we already accept A, but then we must also evaluate $\ulcorner B \rightarrow C\urcorner$ according to the Ramsey test, and this requires us to add B to our stock of beliefs. In doing so, however, we need to keep the belief in A if we are evaluating $\ulcorner A \rightarrow (B \rightarrow C)\urcorner$, while if we are evaluating just $\ulcorner B \rightarrow C\urcorner$, we do *not* have to do so. In the latter case we add B to our stock of beliefs, but whether we believe A or not in doing so is simply contingent on that hypothetical belief state. This difference explains the gap of truth values between $\ulcorner A \rightarrow (B \rightarrow C)\urcorner$ and $\ulcorner B \rightarrow C\urcorner$, and also explains why $\ulcorner A \rightarrow (B \rightarrow C)\urcorner$ and $\ulcorner A \wedge B \rightarrow C\urcorner$ have the same truth values.

Now aside from the Ramsey test, Katz offers (in section II of his paper) two arguments to the effect that the law of exportation does not hold for indicative conditionals. There he tries to establish this thesis by "proving" that the law of exportation does not hold for strong conditionals (in his sense, non-truth functional conditionals), or that "the law of exportation holds only for those conditionals having the truth conditions of the material conditionals" (p.411). If this is true, then that seems bad news for McGee, for he himself assumes that "the English indicative conditional is intermediate in strength between strict implication and material conditional" (p.465)[14]. But I do not think Katz's argument really succeeds. Let us see each of his arguments in order.

In one of his arguments, Katz starts with assuming a principle that an indicative conditional of the form $\ulcorner \phi \rightarrow \psi \urcorner$ is logically true just in case (if and only if) ϕ logically implies ψ (p.409). Call this *principle L*. Now since we can assume that a sentence of the form

(4) $(\phi \rightarrow \psi) \rightarrow (\phi \rightarrow \psi)$

is logically true, given the law of importation it logically implies the sentence of the form

(5) $(\phi \rightarrow \psi) \wedge \phi \rightarrow \psi$.

Then he says,

> Since any sentence having the form of [4] is logically true and since [4] logically implies [5], it follows that any sentence having the form of [5] must be logically true as well. (p.410)

[14] But note that if this implies that $\ulcorner \phi \rightarrow \psi \urcorner$ entails $\ulcorner \phi \supset \psi \urcorner$, then he must have said this only for the sake of argument, since if the conclusion is the failure of MP, this entailment also fails. As I have said, $\ulcorner \phi \rightarrow \psi \urcorner$ can be true even when ϕ is true and ψ is false if MP is not valid for "$\rightarrow$".

If so, given the principle L, it follows that, "if the antecedent of [5] logically implies the consequent of [5], then modus ponens is a valid rule of inference" (*ibid.*). If this is true, then he has shown that *if* the law of importation holds for indicative conditionals, MP is a valid rule of inference. But If MP is valid, if (a) and (b) above are true, (c) must also be true. Or more precisely, since any instances of (5) are logically true,

(6) $(\mathrm{A} \rightarrow (\mathrm{B} \rightarrow \mathrm{C})) \wedge \mathrm{A} \rightarrow (\mathrm{B} \rightarrow \mathrm{C})$

is also logically true, and therefore (given the principle L) (a) and (b) must logically imply (c). Then, Katz claims, it follows that (a) is false (since he agrees and only agrees that (b) is true and (c) is false). Now since, according to him, (a') is true, (a) and (a') constitute a counterexample to the law of exportation. This shows that, *if* MP is valid, the law of exportation fails. Combined with the previous result, what is shown here is that, the law of importation and the law of exportation are mutually incompatible (*ibid.*). But if so, this fact looks a piece of evidence against the law of exportation, for it is so implausible to assume that only one of them, the law of importation and the law of exportation, can hold at the same time [15], and this difficulty in turn seems to force us to conclude that neither of them holds.

This argument, however, in particular the principle L, also begs the question. The fact is that even if (5) is logically true, it does not establish that MP is a valid rule of inference. Let us see the principle L again.

L: $\ulcorner\phi \rightarrow \psi\urcorner$ is logically true if and only if ϕ logically implies ψ.

Now I claim that anyone who is committed to denying MP is also committed to denying the one half of the bi-conditional, namely,

L': If $\ulcorner\phi \rightarrow \psi\urcorner$ is logically true, then ϕ logically implies ψ [16].

For, although L' indeed looks very plausible, the question is whether that plausibility is really independent of MP, and I do not think it is, as we shall see.

Let me first note that, it would make me look mad if I said, "If $\ulcorner\phi \vee \psi\urcorner$ is logically true, then ϕ logically implies ψ". But why? You might say, "The sense of "$\vee$" simply does not license such an inference." But then why, in the case of L', does the sense of the connective "$\rightarrow$" license the inference in question? In questioning MP of

[15] For, it seems, any counterexample against one could easily be made, *mutatis mutandis*, to be a counterexample to the other, so that their truth values are exchanged.

[16] I assume here that L is a material equivalence, and therefore L' must be read as a material conditional. For, if L' is an *indicative* conditional, application of it would involve the implicit *use* of relevant MP, and that would make Katz's argument totally question-begging. But even if L assumes any conditional stronger than material conditional, that obviously does not affect my argument below.

indicative conditionals, we are of course questioning the sense of "$\rightarrow$" too. It would make a great difference to the sense of it if it turned out that MP was not valid for it. The plausibility of L' therefore depends on the sense of "$\rightarrow$", and if we reject MP for it, the logical truth of $\ulcorner\phi \rightarrow \psi\urcorner$ no more entails[17] that ϕ logically implies ψ than does the logical truth of $\ulcorner A \vee \sim A\urcorner$ entail that A logically implies $\ulcorner\sim A\urcorner$.

Also, we have seen that, if MP fails, $\ulcorner\phi \rightarrow \psi\urcorner$ can be true even when ϕ is true and ψ is false. Then, obviously, making $\ulcorner\phi \rightarrow \psi\urcorner$ logically true cannot make ϕ logically imply ψ, *unless* we assume MP. (For, there even if $\ulcorner\phi \rightarrow \psi\urcorner$ is true in every possible world, there are worlds where ϕ is true and ψ is false). Assuming L (and therefore L'), then, Katz in fact implicitly presupposes MP.

The same problem underlies Katz's second argument. There he also starts with the principle L, and with it he shows that the sentence of the form

(7) $(\phi \vee \psi) \wedge \sim \phi \rightarrow \psi$

is logically true (which follows from the application of *the other* half of the principle L, and I have therefore no quarrel with it). But here again, since, given the law of exportation, (7) entails

(8) $(\phi \vee \psi) \rightarrow (\sim \phi \rightarrow \psi)$,

Katz claims that any conditional of the form (8) is logically true, and therefore, its instance,

(d) If either Reagan wins or Anderson wins, then if Reagan does not win, then Anderson will

is logically true. If so, *given the principle L* (in particular, L'), the antecedent of (d) logically implies its consequent, and given also that the antecedent of (d) is true, its consequent, the indicative conditional which is just the same as (c), must also be true, contrary to what we have assumed. Katz generalizes this result as, "in the presence of exportation, any conditional of the form $\ulcorner$if not-ϕ, then $\psi\urcorner$ is true if either ϕ or ψ is, which is to say that a conditional is true if it has a false antecedent or a true consequent" (p.411). Since Katz assumes, as many others do, that $\ulcorner\phi \rightarrow \psi\urcorner$ entails $\ulcorner\phi \supset \psi\urcorner$[18], it follows that, "the law of exportation holds only for those conditionals having the truth conditions of the material conditionals" (*ibid.*), or, in other words, the law of exportation does not hold for any strong conditionals.

Now this argument also assumes L, which, as we have already seen, begs the question against anyone who denies MP, for the plausibility of L' depends on our

[17] In the sense that $\ulcorner\phi \supset \psi\urcorner$ and ϕ entail ψ. See the previous footnote.

[18] Though this is generally admitted, one should reject it if he is to abandon MP. See footnote 14.

acceptance of MP, and therefore to accept L' is just to assume MP. Then let us summarize what Katz has established in the last argument. He has shown that, *implicitly assuming MP*, the law of exportation and indicative conditional (assumed to be stronger than material conditional) are incompatible. But *this is exactly what McGee himself has proved in his paper*! There he gave a proof to the effect that, were the law of exportation and MP both correct, then indicative conditional would be reduced to material conditional[19], while what Katz has done, in effect, is to show, hiding the assumption of MP in the background, that if the law of exportation is correct, indicative conditional will have the truth condition of material conditional, which therefore adds nothing to McGee's original proof.

Thus I conclude that Katz's criticism of McGee's counterexample to MP is not effective. The original intuition that led us to fall out of MP is therefore still alive and well.

We have long believed that MP is a fundamental principle that any conditional must satisfy. McGee presented a convincing counterexample to this principle, at least that of indicative conditionals. But Katz's defense of MP, which relied on the logical principles like C and L, turned out to be just repeating our old belief or appealing to the old intuition. Let us call this kind of argument, that is, the defense of MP that depends on the logical principles, the *logical defense* of MP. From the observations in this paper I conclude that such a defense is doomed to fail, for MP is so deep-rooted in our conception of any conditional (indicatives or otherwise) that any such principles are no more fundamental than MP itself, and therefore the principles themselves would be subject to reconsideration, given that MP turned out to fail for the conditional. Thus anyone who wants to defend MP against McGee must take quite a different approach, if there is any, in order to avoid begging the question (which is actually my next project).

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[19] See pp.465–6 of his (1985). In fact, virtually the same thesis has been proved, before McGee, by Gibbard (1981). There (pp.234–5) Gibbard assumes, in addition to the law of exportation (and importation), (1) $\ulcorner \phi \rightarrow \psi \urcorner$ entails $\ulcorner \phi \supset \psi \urcorner$, and (2) if ϕ entails ψ, $\ulcorner \phi \rightarrow \psi \urcorner$ is true. From these he proves that $\ulcorner \phi \rightarrow \psi \urcorner$ is materially equivalent to $\ulcorner \phi \supset \psi \urcorner$. But (1) is to say that $\ulcorner \phi \rightarrow \psi \urcorner$ is false whenever ϕ is true and ψ is false, and as I have argued, this is to presuppose MP for indicative conditionals.

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