**Trust Logic, Not Tortoises**

“I’m a firm believer in optimism because without optimism, what is there?”[[1]](#footnote-1)

**Section 0: Introduction**

Lewis Carroll’s *What the Tortoise Said to Achilles* is familiar lore.[[2]](#footnote-2) The Tortoise and Achilles meet one afternoon, and the latter shows the former an argument of the following form:[[3]](#footnote-3)

1. ∀x(Px 🡪 Rx)
2. Pa
3. Ra

But the Tortoise claims not to understand the move from lines **(1)** and **(2)** to **(3)**; the Tortoise grants **(1)** and **(2)** are true, but does not feel obliged to hold **(3)** true in virtue of **(1)** and **(2)**. In response, Achilles supplies the Tortoise with a plausible general rule – universal claims, such as that in line **(1)**, apply to any individual in the domain under discussion, and *a fortiori* the individual denoted by “a” found in lines **(2)** and **(3)**. The Tortoise accepts the general rule, but requests it be added to the premises. Once Achilles grants the addition, the pair is off to the races, with Achilles never able to catch up. Following each additional premise, the Tortoise requests another, and Achilles seems compelled to oblige.

There are many ways to interpret Carroll’s puzzle. Some take the lesson to be that there is a difference between implication and inference.[[4]](#footnote-4) Carroll seemed to have this in mind, as evidenced by a letter written to the editor of *Mind,* where the article was published, explaining the puzzle as trading on a conflation of a rule of inference as premise.[[5]](#footnote-5) Others extract more worrisome lessons from the note, e.g. that certain logical rules, such as universal instantiation, are incapable of justification. On this reading, rather than making an illicit request, the Tortoise is revealing a genuine puzzle. When considering the content of a given premise, we often seek justification by examining whether the premise is *true*.[[6]](#footnote-6) In contrast, when considering applications of rules of logic, we often take the rules to wear their justification on their sleeves. What the Tortoise is after on this reading is justification for the rules themselves, a request Achilles is unable to satisfy.[[7]](#footnote-7)

This last reading falls under what Crispin Wright calls the *Justification Question*[[8]](#footnote-8)- we take ourselves to know our basic[[9]](#footnote-9) logical principles are true, but if this is so, wherein lies the justification for this knowledge? Thus understood, the Tortoise is after Achilles’ reasons[[10]](#footnote-10) for accepting universal instantiation as true. Unfortunately, the reasons Achilles provides – which result in additional premises to the argument - presuppose the rule itself, with circular justification leading to regress.[[11]](#footnote-11) As Wright observes, the Justification Question has received much attention, far more than other related epistemological questions concerning our inferential practices.[[12]](#footnote-12) Less attention has been paid, however, to metaphysical questions one might extract from the note. That said, recently compelling reasons have been offered for reading the dialogue as concerned with the *possibility* of adopting basic rules of logic.[[13]](#footnote-13) Specifically, the note appears to reveal conditions under which it is *im*possible for agents to adopt such rules. This reading falls under what Romina Padro[[14]](#footnote-14) calls the *Adoption Question* – under what conditions can rules of logic be adopted? In what follows, we examine consequences a recent answer to this question has for answers to the Justification Question.[[15]](#footnote-15)

 More specifically, in **Section 1**, we examine Kripke and Padro’s recent argument that basic rules of logic - such as universal instantiation - cannot be adopted. If correct, these observations result in a negative answer to the Adoption Question in certain circumstances. We apply this lesson to two putative answers to the Justification Question - Carnap’s doctrine of logical conventionalism and Quine’s holism - finding each suffers from adoption-related problems. Having observed requiring explicit acceptance of basic rules guiding our inferential practices led to adoption-related trouble for Carnap and Quine, in **Section 2**, we examine two answers to the Justification Question that avoid similar trouble. On the first proposal, explicit acceptance of basic rules of logic is weakened to implicit acceptance – regular behavior in accordance with the rule. After arguing this option both avoids Kripke and Padro’s negative result and provides a *prima facie* plausible answer to the Justification Question, closer inspection reveals the proposal has significant costs. On the second proposal, requiring basic rules of logic be accepted at all is dropped by rejecting these rules have propositional content. Rather, on the model of Michael Devitt’s recent work concerning linguistic competence, basic rules of logic are defended as embodied know-how. As before, after arguing this option avoids conflict with the negative results of the Adoption Question and offers a *prima facie* plausible answer to the Justification Question, inspection reveals costs. Nevertheless, it is argued nearly every cost is one shared by the first option, and those costs peculiar to this option are worth paying. We thus provide two ways to answer the Justification Question while respecting the Adoption Question, and argue the second is preferable.

**Section 1: Two Versions of the Regress**

In this section, we extract a negative answer to the Adoption Question with respect to basic rules of logic. Lesson in hand, we turn to two putative answers to the Justification Question: Carnap’s logical conventionalism and Quine’s holism. We show each each conflicts with the negative answer to the Adoption Question. We thus set the stage for the next section, where we propose two answers to the Justification Question that lack such conflict.

*Kripke’s Regress*

Kripke and Padro[[16]](#footnote-16) have suggested the moral to which Carroll is attempting to draw our attention is deeper than justification. It concerns, rather, the conditions under which one may adopt certain basic rules of inference. Indeed, Kripke and Padro interpret Carroll as observing certain basic rules of logic are *impossible*[[17]](#footnote-17) to *adopt*. According to these authors, an agent is said to adopt a rule of logic just in case the agent picks up a way of inferring according to the rule - something the agent was not able to do before - on the basis of the acceptance of the logical rule,[[18]](#footnote-18) where acceptance is understood as a doxastic attitude.[[19]](#footnote-19) Roughly, what makes adoption impossible under these circumstances is that adoption presupposes the rule to be adopted.[[20]](#footnote-20)

To see how this argument works, return to Achilles and the Tortoise. On the reading under consideration, the Tortoise is not merely questioning whether universal instantiation is justified, but rather, is genuinely perplexed by the argument. This is because the Tortoise has never inferred in accordance with universal instantiation and has not otherwise accepted it. The Tortoise is, in effect, asking for clarification from Achilles - rather than justification - but Achilles is only able to reiterate the rule. This is no help to the Tortoise. For if the Tortoise never inferred according to universal instantiation, then telling the Tortoise the rule for universal instantiation is moot. This is because for the Tortoise to accept that line **(1)** is an instance of the general rule governing instances of universal instantiation – every statement of the form found in **(1)** is a universal statement – requires the Tortoise accept the general rule. But observe, the general rule governing universal instantiation is *itself* a universal statement, *precisely* what the Tortoise has not accepted. Kripke and Padro take this to strongly suggest it is impossible for the Tortoise to adopt universal instantiation.

By way of clarification, observe for adoption the Tortoise must infer according to the rule “on the basis of” the rule, where “on the basis of” is not to be understood as merely causal.[[21]](#footnote-21) It would not, for example, count as adopting universal instantiation for the Tortoise to simply be told the rule and that telling cause the Tortoise to infer. That would leave the possibility of adoption hostage to fortune.[[22]](#footnote-22) Rather, “on the basis of” is to be understood as reflecting grounds for which the Tortoise infers, i.e. the Tortoise must infer according to the rule *because* the Tortoise has accepted it. This is because to adopt a rule, as Kripke and Padro understand, is to be guided by the rule, and “…if the principle is going to function as a real guide…acceptance of it should constitute his grounds for inferring according to it.”[[23]](#footnote-23) The Tortoise adopting universal instantiation seems to require the Tortoise be guided by universal instantiation, which requires the Tortoise to have already accepted the rule. The cart is then before the horse; that is the problem.[[24]](#footnote-24)

If correct, Kripke and Padro have identified a rather special non-empty class of logical rules – those that cannot be adopted. Universal instantiation seems a good candidate, as does perhaps *modus ponens*.[[25]](#footnote-25) Moreover, many familiar logical rules plausibly fall outside this class. For example, if we revise the dialogue between the Tortoise and Achilles so that the former has previously inferred according to, say, modus ponens, and the latter is examining a proof involving, say, *disjunction introduction*,[[26]](#footnote-26) it seems the Tortoise may accept this rule without problem. For accepting disjunction introduction does not require previous acceptance of disjunction introduction, and so the Tortoise’s acceptance of this rule may ground relevant inferences. Hence, while Kripke and Padro appear to have identified a non-empty class of basic logical rules, this class is non-trivial.

 The Adoption Question asked under what conditions adoption of logical rules is possible; here we see conditions under which adoption of basic rules is *im*possible. While perhaps not immediately obvious, this result has consequences for answers to the Justification Question.

*Carnap’s Logical Conventions*

Carnap’s doctrine of logical conventions was an attempt to provide an empirically tractable explanation and justification of logical truths.[[27]](#footnote-27) According to Carnap, linguistic conventions in general were essentially stipulations of sentence truth accepted largely on pragmatic grounds, which we “are free to choose and continue to use.”[[28]](#footnote-28) Such stipulation, moreover, provided implicit definitions for expressions involved in said sentences. Applied to logical truths, stipulation via linguistic convention resulted in a set of axioms and rules assumed to be true, which in turn implicitly define logical constants involved in them. For example, one might stipulate any sentence of the form: “ϕ v ~ϕ” is true.[[29]](#footnote-29) According to Carnap, this stipulation - reflecting the law of excluded middle - in combination with other stipulations for the language with which we are working, determines the meanings of the logical constants, in this case, “v” and “~”. Moreover, given this stipulation, and further acceptance of derivation rules governing these linguistic conventions, we can deduce an infinite number of instances of our stipulated logical truths.[[30]](#footnote-30) That is a tidy result.

Carnap’s characterization of logical truths as stipulated convention accompanied by deductive rules showed how logical truths may be empirically agreeable.[[31]](#footnote-31) We need not look out into the world to determine whether a given logical truth is, in fact, true; the issue is decided by fiat, and motivated by pragmatic considerations. Additionally, inferences were themselves evaluable based on these stipulations, providing one the resources to distinguish good inferences from bad.[[32]](#footnote-32) These observations suggest a plausible reading of Carnap as providing an answer to the Justification Question. Recall, the question asked what justifies our presumed knowledge of basic rules of logic. Carnap’s answer is that our knowledge of these stipulations – that they are true – is relative to a language in which they are used. Internal to the language, assuming we have avoided stipulations generating syntactic inconsistency, rules of logic are justified insofar as they contribute to a consistent formal theory. External to the language, rules of logic are justified insofar as they serve their purpose, determined on pragmatic grounds.[[33]](#footnote-33)

Quine[[34]](#footnote-34) famously targeted Carnap’s doctrine of logical conventions with Carroll’s note. Quine claimed for Carnap’s proposal to work – for logical truths to be established by stipulation – one will require logical inferences that are not simply the result of stipulation. For example, were we to stipulate as a convention that all replacements of propositional letters “P” and “Q” in “If P and Q, then P” resulted in logical truths, then to apply this to an instance, the instance must be connected somehow to that stipulation. A natural way to provide a bridge is by appealing to a rule of the form: “All replacements of “P” and “Q” in “If P and Q, then P” by sentences are logical truths.” That would do the trick, but since the statement of the rule lacks empirical content, it must itself be stipulated. That, of course, leads to a Carroll-style[[35]](#footnote-35) stipulation regress. Quine concludes from these observations that Carnap’s notion of logical truths as a matter of convention cannot work.

Quine’s deployment of Carroll’s note catches Carnap in a regress, but with Kripke’s reading of the note we might raise further trouble for Carnap. For Carnap, logical conventions are *explicit* stipulations, and so must be represented in some manner by the stipulator. Clearly, many of us infer according to universal instantiation, but if Carnap is correct it seems each of us at some time must have explicitly stipulated universal instantiation as a rule guiding our inferential practices. Presumably, it follows each of us must have then accepted universal instantiation as a rule. But this is precisely the sort of case Kripke’s reading of Carroll’s note rules out. Accepting universal instantiation to guide our inferential practices cannot require prior explicit acceptance of universal instantiation. Hence, Carnap’s explicit stipulation requirement is too demanding. Now, a natural suggestion at this point is to weaken the claim that stipulations be explicit, relying instead on, say, *implicit* stipulations. This is, in fact, a strategy Quine considered on behalf of Carnap as a way to avoid the regress raised above.[[36]](#footnote-36) According to this strategy, we either come equipped with or implicitly accept stipulations through behavior without initially representing them in, say, words. Insofar as this strategy avoids requiring agents explicitly accept basic rules of logic, it seems to avoid adoption-related worries. That said, Quine claimed this strategy undermined the justificatory role Carnap intended logical conventions to play, since it is not obvious how to distinguish behavior following implicit conventions from merely regular behavior. Moreover, if we are not in a position to distinguish implicit stipulations from merely regular behavior, it makes little sense to appeal to the former as explaining anything, for it is not at all clear what explanatory role – if any - they play.[[37]](#footnote-37) Indeed, in “dropping…explicitness from… linguistic convention we risk depriving [it] of any explanatory force and reducing it to an idle label.”[[38]](#footnote-38) If Quine is correct, implicit stipulation is not an option for Carnap.[[39]](#footnote-39) Consequently, it seems Carnap’s logical conventionalism is undermined on at least two fronts. From Quine we learn logical conventionalism is susceptible to a justification regress; from Kripke we learn logical conventionalism makes false predictions with respect to how agents acquire basic logical rules.

*Quine’s Tangled Web of Belief*

As an empiricist, Quine was sensitive to the fact that undermining Carnap’s attempt at providing an empirically tractable notion of logical truths demands some alternative explanation. According to Quine, logical, mathematical, and scientific claims were on par in their respective dependence on experience, all interconnected in a web of belief. Evidence gleaned from experience was claimed to have more of an influence on the outskirts of the web, but ultimately there was no aspect of the web off limits to revision in light of experience. Claims in the web, moreover, were related to other claims in the web via logical connections, so that changes in one portion of the web would thereby entail changes in others. Various theses constitute Quine’s counterproposal, e.g. sentence meaning is determined holistically, confirmation is done at theory level, no sentence is immune from revision.[[40]](#footnote-40) For simplicity, call the collection of these theses Quine’s *holism*.

Quine considered holism an improvement over Carnap’s proposal. Rather than there being a difference in kind between stipulated truths and empirical truths, there was merely a difference in degree. Accordingly, Quine found no need to separate logical truths from the rest of our knowledge; logical truths are empirically justified like everything else. Just as empirical evidence for claims on the periphery provide justification for those claims, with the logical connections kept in mind, empirical evidence also provides justification for claims near the center of the web, i.e. logical truths. Quine thereby provides a replacement answer to the Justification Question - Why are basic logical rules justified? Because they are confirmed by our evidence, and result in a satisfying balance of truths in the web of belief, where balance is determined by evaluating theoretical virtues of the distribution of truth values to sentences in the web.

Among revisable elements in the web we find not only empirical hypotheses and logical truths, but also logical interrelations – logical rules.[[41]](#footnote-41) Hence, even basic logical rules are open to revision according to Quine. This observation suggests Quine’s holism is susceptible to regress comparable to that leveled against Carnap.[[42]](#footnote-42) We will not attempt to arbitrate that, but instead pose an adoption-related complaint one might raise against Quine. To be sure, Quine’s insistence that even basic logical rules are *revisable*, just like any empirical hypothesis, suggests Quine is committed to basic logical rules being *adoptable*. This would be a problem for Quine since, as have seen, basic rules like universal instantiation are *not* adoptable. But Quine is not obviously committed so. Treating basic rules as on par with scientific hypotheses with respect to empirical justification does not entail they are on par with respect to whether they can be adopted or not. Nevertheless, Quine’s insistence that even basic rules of logic are up for revision suggests agents accept them, and accept them as guides for inferential practices. Moreover, for Quine, rules that guide agents must be explicitly accepted by them.[[43]](#footnote-43) Otherwise, since we have only behavioral evidence to go on and since extensionally equivalent sets of rules may satisfactorily characterize an agent’s behavior, we could not determine which rules were true of the agent. Explicit acceptance of rules provides evidence useful in identifying the correct set of rules. But we know from our preceding discussion of Carroll’s note that basic rules of logic cannot – at least at inception – have been explicitly accepted by an agent to guide inferential practices. Hence, basic rules must have been acquired by agents in some other way. Quine then owes some explanation that fits with basic rules as revisable but not explicitly accepted as guidance - at least at first. Hence, while Quine’s deployment of Carroll’s note provides a powerful regress objection to Carnap’s logical conventionalism, a deeper understanding of the note reveals a lacuna in Quine holism; much like Carnap, Quine defends an answers to the Justification Question that runs into adoption-related woes.

Clearly, we *do* act in accordance with basic rules of logic, though we could not have adopted them. What explanation can be provided for this phenomenon that respects the negative answer to the Adoption Question? Moreover, what consequences would such an explanation have for answers to the Justification Question? We turn to these difficult questions in the next section.

**Section 2: Basic Rules as Know-How**

In this section, we examine two answers to the Justification Question which respect observations stemming from the Adoption Question. The first claims basic rules of logic are implicitly accepted by agents through regularities of behavior, and are justified by those very regularities; the second claims basic rules are embodied know-how, justified since evolutionarily advantageous. Costs and benefits are assessed for each, and it is argued the second answer is preferable to the first.

*Explicit and Implicit Acceptance*

In their respective answers to the Justification Question, Carnap required the content of logical conventions be made explicit, while Quine’s holistic counterproposal left it unclear how agents acquire basic rules of logic. The lesson of the preceding section seems to be that an answer to the Justification Question should be consistent with the negative results stemming from reflection on the Adoption Question. To that end, we examine the space of answers available to the Justification Question, given this restriction.

Recall, adoption of a rule of logic requires acceptance of the rule, and being guided by that rule in relevant inferences based on that acceptance. Adoption requiring the rule be a “real guide”[[44]](#footnote-44) for the agent suggests the rule be *explicitly* accepted by the agent. We have seen, however, that requiring explicit acceptance of basic rules of logic leads to trouble, since explicit acceptance of, say, universal instantiation under certain conditions then requires having explicitly accepted the basic rule prior. A natural thought is that we might avoid adoption-related worries by dropping explicit acceptance for basic rules of logic. We might instead hold that basic rules of logic are *implicitly* accepted. Quine provided just such a model for implicit acceptance earlier: to implicitly accept a rule is to behave according to the rule, and to have that rule accurately fit or describe your behavior.[[45]](#footnote-45) Implicitly accepting universal instantiation then amounts to regularly inferring in accordance with it – nothing more, nothing less. Of course, Quine also claimed implicit acceptance – applied to logical conventions – had undesirable costs. We revisit those costs - and others – momentarily to determine whether they are worth paying. For now, observe implicit acceptance of basic rules of logic provides one way to avoid the adoption puzzle. If agents are not required to explicitly accept basic rules of logic, but are instead permitted to implicitly accept them, there is no obvious trouble. An agent may, for instance, accept universal instantiation because the agent behaves such that they are accurately described as implicitly accepting the rule. Moreover, having implicitly accepted universal instantiation, plausibly an agent may explicitly accept the rule. That is, an agent having implicitly accepted universal instantiation may – perhaps after having reflected on their own behavioral patterns – explicitly accept the basic rule as a guide for inferential practices. Since this later explicit acceptance of the basic rule does not presume the agent previously explicitly accepted the rule, there is no issue.

Of course, this is *not* to say appealing to implicit acceptance *dissolves* the negative answer to the Adoption Question. Implicit acceptance merely sidesteps the issue. The Tortoise was assumed to have never inferred according to universal instantiation prior to the dialogue. Reading “according to” as the rather weak “in accordance with” rather than the stronger “based on explicit acceptance of” makes this clear. If the Tortoise never inferred in accordance with universal instantiation prior, then the Tortoise could not even be accurately described as implicitly accepting the basic rule. Hence, relying on implicit acceptance provides no help to the poor Tortoise. Implicit acceptance is considered here as a way to respect, rather than undermine, this result. This should not, however, be counted among costs of the proposal. Our task is not to help to incorrigible Tortoise, but to examine the space of answers to the Justification Question while avoiding adoption-related woes. If this implicit acceptance proposal avoids the adoption worry, then it earns its keep based on whether it provides a reasonable response to the Justification Question: We take ourselves to know basic rules of logic are true, but what justifies that knowledge? On this proposal, we implicitly accept basic rules of logic, which is simply to say we behave in accordance with the rules. Moreover, we behave as if the basic rules are *true*. For example, universal instantiation is implicitly accepted by an agent when they behave such that whenever a universal statement is true, so too is each instance in the domain of that statement. The reason we cite, then, as justification for our knowledge of universal instantiation is a relevant pattern of behavior.

This is perhaps an unsatisfying answer. But we might supplement by noting agents are often engaged in projects[[46]](#footnote-46) of categorization, dividing the world into lions, tables, functions, events, etc., and these projects presuppose basic rules of logic, such as universal instantiation and modus ponens.[[47]](#footnote-47) Given that doubting this presupposition would undermine these projects, and absent reasons to doubt the truth of the relevant rules, agents might legitimately claim themselves entitled[[48]](#footnote-48) - having epistemic rights that need not be understood by or accessible to the agent - to use the rules. Entitlement seems a happy fit with implicit acceptance, and while it may fall short of genuine justification, given the difficulties philosophers have had in providing the latter for basic rules of logic,[[49]](#footnote-49) entitlement may be the best we can do. In any event, we might sweeten the implicit acceptance proposal to make it more appetizing. It seems a hallmark of rules that they apply in novel cases. Implicit (or explicit) acceptance of rules reflects this. An agent need not, say, observe every instance of a universal statement to be sure each instance of the relevant domain is covered by the truth of the statement. Agents bearing attitudes towards rules that can be assessed for application in novel scenarios bears this out. Moreover, implicit acceptance provides a *prima facie* way to distinguish adoptable rules, e.g. disjunction introduction, of logic from basic rules of logic that cannot be adopted, e.g. universal instantiation. On this proposal, both sorts of rules can in principle be implicitly accepted based on behavioral regularities, but that does not in turn require both sorts can also be explicitly accepted. It is consistent with this proposal to treat adoptable rules of logic as those that can be explicitly accepted without having been previously accepted, and basic rules of logic as those that cannot be explicitly accepted without having previously been implicitly accepted. More concretely, an agent may either explicitly or implicitly accept disjunction introduction as a rule of logic guiding inferential practices, but explicitly accepting universal instantiation requires having previously implicitly accepted this basic rule. Consistency with the asymmetry between adoptable and basic rules is thus maintained.

But despite these benefits, the implicit acceptance proposal suffers from serious costs. First, since implicit acceptance is gleaned from behavioral regularities it is not obvious how mere regularities of behavior are to be distinguished from genuine rules. Intuitively, basic rules of logic are not mere regularities; we tend to think they are inviolable, necessary truths. But if basic rules such as universal instantiation are implicitly accepted based on behavioral regularities, it is unclear how they are distinct from other behavioral regularities which are, presumably, violable and contingent. Sally behaves such that she implicitly accepts universal instantiation, but even if she did not, it seems the basic rule would be true, and necessarily so. Compare: Sally goes to bed at 10pm regularly and so behaves such that she implicitly accepts a rule to go to bed at 10pm. Were Sally to begin going to bed at 9pm, and so exhibit behavior such that she implicitly accepts a rule to go to bed at 9pm, it is unintuitive to claim Sally’s ‘go to bed at 10pm’ rule was still true, and necessarily so. Behavioral regularities lack the privileged status of rules of logic, so treating them on par seems implausible.

Second, implicit acceptance seems unable to distinguish between *competence* and *performance*.[[50]](#footnote-50) This distinction was initially drawn in linguistics, and can be illustrated with a simple example. A child might describe a recent swimming event by saying “I swimmed.” This is, of course, ungrammatical. Adult speakers do not typically make parallel conjugation errors, but instead say “I swam.” When correcting children who have spoken thus with the correct conjugation, children tend to respond with something like “That’s what I said. I swimmed,” exhibiting a lack of awareness of the mistake.[[51]](#footnote-51) In contrast, when adult speakers utter ungrammatical mistakes such as “I swimmed,” and are corrected, they typically concede a mistake has been made. Linguists claim the child lacks, but adults typically have, competence with the relevant language. When competent adults make grammatical mistakes, these are considered errors of performance rather than a lack of competence. We can easily transpose this distinction to our discussion. Competence with a basic rule amounts to knowing the rule and how to apply it; performance is the actual application of the rule. Consider now, standard introductory logic courses incorporate formal rules found in propositional logic, some of which are basic rule candidates e.g. modus ponens, conjunction elimination[[52]](#footnote-52), etc. Students often complain they already know these rules, or that they are so obvious as to not be worth stating. In response, it is not difficult to persuade students of the importance of covering, say, modus ponens in some detail by considering how negated antecedents or consequents may mislead[[53]](#footnote-53) or by examining the Wason Selection Test.[[54]](#footnote-54) Students routinely *perform* poorly on these tasks, and yet, there are reasons to think they are nevertheless *competent* with rules like modus ponens. Some defeasible evidence was stated above, namely, students regularly claim knowledge of basic rules like modus ponens. Further evidence can be found in reports that participants who failed Wason’s Selection Test, when told the correct answer, unanimously agreed it was correct.[[55]](#footnote-55) An agent agreeing they have erred is a hallmark of performance error. I might add, as an anecdote, I have never experienced a student who defends affirming the consequent after I have explained what is wrong with it.[[56]](#footnote-56) But implicit acceptance is unable to make this distinction, and for fairly obvious reasons. Acceptance is based entirely on behavioral regularities, i.e. performance. If the implicit acceptance proposal is correct, the regular failings by students to correctly apply basic rules of logic indicates they do not implicitly accept these rules, though they claim to know them and admit they have erred when the error is made clear. That seems the wrong result.

Perhaps this is too quick. It might be objected that a student’s concession of error in application of basic rules of logic is itself behavior reflecting at least implicit acceptance of the rule. This may provide some grounds for claiming introductory logic students behaving in this manner do, in fact, implicitly accept basic rules, despite trouble applying them. Maybe so. But even if this is granted, we might nevertheless wonder whether students never provided the opportunity to agree or disagree with corrections to their erroneous applications of basic rules of logic would implicitly accept these rules or not. No doubt this depends largely on how wide “opportunity”, “agree”, “disagree”, and “corrections” are understood. In any event, it is unclear whether and how the implicit acceptance proposal offered here can distinguish between competence and performance traditionally understood. This may be, then, less a cost and more a challenge to the view.

 Third, and perhaps clear from the initial presentation of the proposal, implicit acceptance seems to undermine basic rules of logic as providing legitimate guidance for inferential practices. Rather, implicitly accepted rules are descriptive facts about regular patterns of behavior. But if basic rules of logic do not legitimately guide inferential practices, these practices seem to lack the normativity typically associated with them.[[57]](#footnote-57) For example, were Sally to implicitly – but not explicitly - accept universal instantiation, but deviate on occasion from inferring accordingly, at best we might say Sally is not behaving as she normally behaves, or perhaps is not behaving as members of her community behaves, assuming most members of her community implicitly accept the rule. But those who think rules of logic have normative force will claim Sally’s logical error makes her an appropriate target of – perhaps minimal - blame. If Sally fails to infer according to universal instantiation, it seems compelling to say Sally *should* have inferred according to the rule, where “should” here is stronger than merely “not what Sally usually does.”[[58]](#footnote-58)

*Know How and Know That*

Given costs associated with the implicit acceptance proposal, it is worth considering an alternative way to answer the Justification Question while respecting the Adoption Question. Dropping *explicit* acceptance was one option, and this seemed – as indicated among the costs – to drop legitimate guidance of inferential practices as well. Another option is to adjust *acceptance* to avoid the trouble, though in such a way as to avoid dropping guidance of inferential practices as well. Observe though, it was not dropping explicit acceptance *per se* that undermined legitimate guidance of inferential practices, but rather replacing explicit with implicit acceptance. Dropping explicitness does not thereby drop guidance, and so adjusting acceptance in some other manner does not thereby undermine guidance. Indeed, we might drop *acceptance* entirely,[[59]](#footnote-59) not requiring agents bear this doxastic attitude towards the content of basic logic rules at all.[[60]](#footnote-60) And we need not replace acceptance as a requirement if we also drop the presupposition made throughout our discussion that the basic rules of logic have *content*. For if basic rules of logic lack content, then agents cannot stand in doxastic attitudes to them.

And agents might still be *guided* in their inferential practices by basic rules lacking content. This is not an entirely novel notion; we find Devitt defending a similar proposal with respect to linguistic competence. In his discussion, Devitt makes heavy use of the distinction between knowledge-how and knowledge-that, which is easy enough to elucidate. Flying a plane, swimming, walking, are species of know-how; that a plane is flying, that one is swimming, that one is walking, are species of knowledge-that. According to Devitt, know-how[[61]](#footnote-61) does not necessarily involve propositional knowledge.[[62]](#footnote-62) Still, rules understood as either the former or the latter may provide guidance for practices of agents. Devitt claims they differ, however, in whether governance is *represented* by the agent. Propositional knowledge governs “…by being represented and applied…” whereas knowledge-how governs by being “…simply embodied without being represented.”[[63]](#footnote-63) Transposed to our discussion, we may understand knowledge of basic rules of logic - which lack propositional content - as know-how, encoded or “hard-wired” in agents who embody the rule.[[64]](#footnote-64) As such, basic rules of logic such as universal instantiation may thereby govern inferential practices without requiring representation by the agent.

 Altogether then, our second option drops the requirement that basic rules of logic must be accepted by rejecting that they *can* be accepted - since they lack content - yet this option allow rules *may* guide inferential practices insofar as they are embodied know-how of agents.[[65]](#footnote-65) As should be clear, this proposal avoids the negative answer to the Adoption Question, since basic rules of logic thus understood cannot be accepted. This is still no help to the Tortoise, but again, this should not be considered a cost. Avoiding the negative results of the Adoption Question is not enough for the current proposal to be viable; it must also provide a plausible answer to the Justification Question. We take ourselves to know basic rules of logic are true, but how are we justified in that knowledge? If our presumed knowledge of basic rules of logic is understood to be propositional, as implied by the question, then since the current proposal rejects that we have such knowledge, it rejects the question. That is an unsatisfying result. But we need not take this to show the current proposal is not viable, for there is a further response an advocate of this proposal might offer to the Justification Question.

While it is assumed basic rules of logic are hard-wired know-how that cannot be accepted, this is consistent with this embodied know-how in some cases generating propositional knowledge, representing the embodied know-how. Consider again introductory logic students who claim familiarity with some basic rules of logic, despite lacking facility in applying this knowledge to novel circumstances. Arguably, identification of and instruction in the proper use of rules like modus ponens generates propositional knowledge of the rule, which plausibly reflects embodied know-how students already have.[[66]](#footnote-66) This propositional knowledge, in turn, may be used explicitly by students to guide inferential practices, and guard against fallacious reasoning. Now, propositional knowledge reflecting basic rules of logic in hand, and assuming we take ourselves to know such rules are true, we might successfully inquire as to what justification we have for that knowledge. Assuming this propositional knowledge accurately reflects basic rule know-how – which is surely contestable – it might be claimed what this propositional knowledge reflects is, like other embodied know-how,[[67]](#footnote-67) inherited from our ancestors, and in that respect may have offered some evolutionary advantage to our species, e.g. providing efficient information processing and retrieval. For example, universal instantiation may provide an efficient means by which, say, information received through our perceptual system is categorized, and which lends itself to efficient information extraction. Of course, like any “just-so” evolutionary tale, we should remain cautious; the devil is in the details.[[68]](#footnote-68) Still, this is at least a *prima facie* plausible response to the Justification Question. The reason we cite in in justification of our knowledge that basic rules of logic are true is propositional knowledge reflecting embodied rules that likely conferred evolutionary advantage to our ancestors. Furthermore, even if this answer is rejected as, say, inadequate, we might here too lean on agents’ engagement in cognitive projects which presuppose basic rules of logic, along with an absence of counterexamples to the truth of these rules.[[69]](#footnote-69) In other words, we may claim ourselves entitled to take these rules as true, even if we are not strictly speaking justified. In sum, we avoid adoption-related worries by treating basic rules as embodied know-how which fits nicely with citing inheritance and evolutionary advantage as justifying said rules, and ultimately if this justification falters, it falters no worse than the implicit acceptance proposal offered above.

There are benefits worth mentioning. Per motivation for this proposal, basic rules of logic provide legitimate guidance for inferential practices. Hence, an agent failing to infer according to universal instantiation – assuming the rule is embodied by the agent – commits a logical error, and is thus the appropriate target of blame to that extent. More specifically, if basic rules are hard-wired know-how and typically exhibited by most members of our species, as seems correct, then failing to infer according to basic rules is to fail to act as one should, and not merely as one has.[[70]](#footnote-70) Additionally, treating basic rules of logic as embodied know-how provides resources for distinguishing rule-guided behavior from mere regularities. Sally’s regular bedtime need not reflect any rule, though Sally’s regular inferences reflecting basic rules of logic - on this proposal - do. Related, this proposal has little trouble distinguishing competence and performance. Assuming Sally embodies universal instantiation know-how, we may attribute competence to Sally without claiming Sally will always, or even regularly, infer accordingly. Sally may, for instance, embody the rule yet have a terrible memory, leading to terrible performance; competence may be preserved while performance suffers. Just as children tend to develop linguistic competence, reaching various milestones in a short span, so too it might be argued children develop parallel *logical* competence.[[71]](#footnote-71) One might easily extend this proposal as postulating a logic faculty on par with the language faculty, the latter widely accepted by the linguistics community.[[72]](#footnote-72) Finally, this proposal has little trouble distinguishing adoptable from basic rules of logic. Adoptable rules are not embodied know-how, but are instead explicitly accepted. Students may struggle to, say, accept propositional logic rules that do not seem to match their embodied know-how, e.g. *ex false quodlibet*.[[73]](#footnote-73) Nevertheless, with enough practice, students eventually accept these rules. After sufficient familiarity, they may even set the rules aside and infer.[[74]](#footnote-74)

 Despite the preceding praise, it is worth emphasizing the oddity of postulating basic rules of logic as embodied know-how. Empirical research, paralleling that done in linguistics, might make the conjecture more palatable, or perhaps less. Ultimately, more work must be done articulating and testing the proposal, which is more a challenge than a cost. There may be costs to be had, however. We might conjure Quine once more with respect to rules that guide agents which are not explicitly accepted by them, to illustrate. Transposed to our discussion, Quine might claim extensionally equivalent sets of basic logical rules may be equally satisfied by agents’ behaviors, though only one set might be true of the agent. If we are limited to observations of agent behavior, we have no insight into which set of basic rules satisfying behavior is true of the agent.[[75]](#footnote-75) If correct, Quine might continue, postulating embodied basic logical rules is explanatorily useless. There are a handful of responses one might offer,[[76]](#footnote-76) but for our purposes it suffices to observe if Quine’s objection is successful against the current proposal, it seems equally successful against the implicit acceptance proposal.[[77]](#footnote-77) For if the only evidence one has for implicitly accepted rules is regular behavior, and there are extensionally equivalent sets of rules satisfying said behavior, then the worry goes through all the same. Hence, if a cost for embodied basic rules it does not make the proposal less palatable than the alternative canvassed earlier.

Turning to another potential worry: though we put aside concerns that we have not provided satisfying aid to the Tortoise, we might take as a cost the severity with which the current proposal treats the Tortoise, as compared with the implicit acceptance proposal. For on the current proposal, there is no help for the Tortoise, save providing it - perhaps through physical alteration - with hard-wired rules. Our first option at least permitted the Tortoise – if its behavior accorded with the basic rules – to be characterized as having the rule in some sense. Of course, this was because implicit acceptance does not distinguish between accidental regularities of behavior and genuine rule-guided behavior, so the Tortoise may gain membership in our logical community on the cheap. It is a feature of the current proposal, however, that membership be somewhat exclusive. For my part, I find this cost worth paying; my preference rests with logic, not tortoises.

**Section 3: Conclusion**

Carroll’s note has motivated many important questions, two of which – the Justification Question and the Adoption Question – occupied us here. Reflection on the latter constrained defensible answers to the former. Carnap’s logical conventionalism and Quine’s holism each conflicted with these constraints to some degree. Two further answers to the Justification Question were provided, each of which avoided the problems found associated with Carnap and Quine. The first claimed basic rules of logic were implicitly accepted, but was found susceptible to a host of objections. The second – more drastic proposal – claimed basic rules of logic lacked content, but were rather embodied know-how. Costs and benefits of the second were weighed against those of the first, with the second option prevailing as preferable. Nevertheless, more than mere outline is needed to determine if the second option is viable. Moreover, there are surely other options to consider, despite our focus here. Exploration may reveal yet a third option, preferable to the second.

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1. Saul Gorn, *Compendium of Rarely Used Cliches.* [↑](#footnote-ref-1)
2. (Carroll, 1895). [↑](#footnote-ref-2)
3. I have taken a few liberties in presenting Carroll’s regress, but the point remains. [↑](#footnote-ref-3)
4. (Russell, 1903) distinguished implication – the form ‘if p then q’ – from inference – the form ‘p therefore q’ – and claimed the former held between unasserted, and the latter between asserted, propositions. Hence, the Tortoise’s request is illicit. See too (Geach, 1965). (Wisdom, 1974) claims the puzzle conflates object/meta-language. [↑](#footnote-ref-4)
5. (Dodgson, 1977, p. 472) [↑](#footnote-ref-5)
6. We use “content” and “proposition” as synonyms. One way of providing justification for a proposition expressed by, say, the sentence “John has blue eyes” is by observing John has blue eyes. Simple truth correspondence is assumed. [↑](#footnote-ref-6)
7. (Quine, 1936) and (Boghossian, 2008), among many others, seem to have such a reading in mind. [↑](#footnote-ref-7)
8. (Wright, 2004, pg. 155) ultimately distinguishes first and second-order versions. The first-order justification question concerns the provenance of our logical knowledge; the second-order justification concerns our knowledge claims. [↑](#footnote-ref-8)
9. “Basic” is not here meant in the sense that some rules of logic can be derived from other basic rules. [↑](#footnote-ref-9)
10. The sense of “justification” is from (Burge, 1993, pg. 458), where justification requires reasons accessible to the agent. [↑](#footnote-ref-10)
11. (Boghossian, 2001) calls this “grossly circular” justification. They are contrasted with “rule-circular” arguments Boghossian defends as an answer to the Justification Question. [↑](#footnote-ref-11)
12. Wright identifies two other relevant epistemological questions: How does warrant transfer from premises to conclusions? What at the level of movement of thought is inference? (Wright, 2004, pg. 155). [↑](#footnote-ref-12)
13. (Padro, 2015) [↑](#footnote-ref-13)
14. (Padro, 2015, pg. 22) [↑](#footnote-ref-14)
15. This is not to overlook Wright’s other questions. Plausibly, answers to the Justification Question provides answers to the others, assuming a normative relationship between reasoning and logical rules (Padro, 2015, pg. 10, fn. 14). [↑](#footnote-ref-15)
16. (Padro, 2015). [↑](#footnote-ref-16)
17. This is the *logical* sense of possibility (or perhaps *metaphysical* sense), rather than, doxastic, epistemic, or deontic sorts. [↑](#footnote-ref-17)
18. (Padro, 2015, pg. 38; 42). [↑](#footnote-ref-18)
19. Acceptance is traditionally understood as distinct from belief in being voluntary and perhaps directed at content the agent takes to be false. A physicist may, for example accept a theory without taking it to be *true* strictly speaking, and so not believe the theory. Yet, the physicist’s research may be based on this acceptance nonetheless. In **Section 2**, we weaken the “voluntary” feature of acceptance. If this is unforgivable, call it acceptance\* for our purposes. [↑](#footnote-ref-19)
20. (Boghossian, 2003) has a similar reading of Carroll, though drawn from considering the Justification Question. (Hanna, 2007)’s *logocentric predicament* - a phrase from (Sheffer, 1926) – ‘to give an account of logic we must employ logic,’ also seems a similar reading, and is also motivated by the Justification Question. [↑](#footnote-ref-20)
21. (Padro, 2015, pg. 41-43). [↑](#footnote-ref-21)
22. Might Achilles successfully propose an imperative: ‘From any universal statement, deduce any instances’? One might think were the Tortoise to adopt this imperative the puzzle would dissolve. Putting aside issues with the imperative (deduce *every* instance; that’s impractical), this will not help. For the Tortoise to recognize **(1)** falls under the imperative presupposes universal instantiation, just as in the previous case. Shifting speech acts is no help. [↑](#footnote-ref-22)
23. (Padro, 2015, pg. 42). [↑](#footnote-ref-23)
24. One sees a similar worry motivating Kant’s discussion of objects (Kant, 1997; Sec. 7-9) where he observes without previously grasping the notion of an object, one could not grasp the notion of an object. [↑](#footnote-ref-24)
25. In symbols: P, P🡪Q |- Q. We need not specify all members of the class to make the point; all that is needed is the class be non-empty. [↑](#footnote-ref-25)
26. In symbols: P |- (P v Q). [↑](#footnote-ref-26)
27. (Carnap, 1934), (Ayer, 1946). [↑](#footnote-ref-27)
28. (Carnap, 1956). [↑](#footnote-ref-28)
29. I am sloppy here with use-mention, but context disambiguates. Greek letters are propositional variables; “v” denotes propositional logic disjunction; “~” denotes propositional logic negation. [↑](#footnote-ref-29)
30. “…logical truths, being infinite…must be given by general conventions rather than singly…” (Quine, 1984, pg. 108). [↑](#footnote-ref-30)
31. Carnap claimed to “…combine the basic tenet of empiricism with a satisfactory explanation of the nature of logic and mathematics,” avoiding the ‘pure intuitions’ of Kant and the ‘naïve empiricism’ of Mill (Carnap, 1963, pg. 47). [↑](#footnote-ref-31)
32. For Carnap, differing analyses of the validity of an argument depends on differing languages. If, say, classical and intuitionist logicians disagree over the validity of an argument, they are talking past one another. As (Restall, 2001, pg. 4) puts the point, in distinguishing Carnapian tolerance from logical pluralism, “…disputants…over the validity of an argument literally disagree in their *reading* of the argument…there can be no real disagreement.” [↑](#footnote-ref-32)
33. (Carnap, 1950, pg. 17) gestures at a distinction between what we might call questions of internal justification and those of external justification, which tracks his general distinction between internal/external questions. [↑](#footnote-ref-33)
34. (Quine, 1936), (Quine, 1954). [↑](#footnote-ref-34)
35. (Quine, 1984, pg. 108). [↑](#footnote-ref-35)
36. (Quine, 1936, pg. 98). [↑](#footnote-ref-36)
37. (Quine, 1936, pg. 99). It is worth noting claiming implicit stipulations are widely or firmly accepted provides little help, since regular empirical claims share this feature as well, and are presumably not stipulated truths. [↑](#footnote-ref-37)
38. (Quine, 1936, pg. 100). Quine seems skeptical one gains anything by calling a stipulation “implicit”, over and above calling mathematical truths *a priori*, or behavioral statements *firmly accepted*. [↑](#footnote-ref-38)
39. We return to this in **Section 2** where we articulate a parallel view and consider whether Quine’s worries are persuasive. [↑](#footnote-ref-39)
40. Thanks for Sean Ebels-Duggan for helping me keep Quine’s assorted theses straight. [↑](#footnote-ref-40)
41. Quine writes, “logical laws…[are]…further statements of the system…having re-evaluated one statement we must re-evaluate others…which…may be the statements of logical connections themselves.” (Quine, 1951, pg. 42). See too (Priest, 1978) where he makes a similar point. [↑](#footnote-ref-41)
42. (Wright, 1986), (Boghossian, 2000). [↑](#footnote-ref-42)
43. (Quine, 1970, pg. 386) who writes an agent “…is not guided by the rule unless the [agent] knows the rule and can state it.” Quine seemed to anticipate or echo a common theme at the time, e.g. (Searle, 1972). [↑](#footnote-ref-43)
44. (Padro, 2015, pg. 42) [↑](#footnote-ref-44)
45. (Quine, 1936, pgs. 98-100; 1970, pg. 386) [↑](#footnote-ref-45)
46. (Wright, 2004, pg. 163-4). [↑](#footnote-ref-46)
47. This presupposition must not require explicit acceptance, for fear of adoption-related worries. (Hanna, 2007) relies on the basic rule presupposition as justification, but requires explicit acceptance, and thus can expect adoption woes. [↑](#footnote-ref-47)
48. (Burge, 1993, pg. 458); in contrast justifications require accessible reasons. [↑](#footnote-ref-48)
49. See (Boghossian, 2000) and (Dummett, 1991) for opinionated overviews of the difficulties. [↑](#footnote-ref-49)
50. The distinction is drawn from (Chomsky, 1965, pg. 3) and widely accepted in linguistics communities, though see (Quine, 1970) for behaviorist inspired worries. [↑](#footnote-ref-50)
51. Thanks to Michael Glanzberg for this point. [↑](#footnote-ref-51)
52. In symbols: P&Q |- P/Q [↑](#footnote-ref-52)
53. (Schroyens, Schacken, D’Ydewalle, 2001) found that while 97% of individuals correctly identified valid modus ponens arguments, this percentage dropped precipitously, to 72% when evaluating modus tollens (P🡪Q, ~Q |- ~P). Moreover, 63% of individuals incorrectly evaluated instances of affirming the consequent (P🡪Q, Q |- P) as valid, while 55% incorrectly identified instances of denying the antecedent (P🡪Q, ~P |- ~Q) as valid, while 55% incorrectly identified instances of denying the antecedent (P🡪Q, ~P |- ~Q) as valid. [↑](#footnote-ref-53)
54. The Wason Selection Test exhibits simple modus ponens/tollens reasoning, where participants are asked which of four cards must be turned over to test a stated claim (Wason, 1977), resulted in 90% answer incorrectly; [↑](#footnote-ref-54)
55. As reported in (Bentham, 2008). [↑](#footnote-ref-55)
56. My favorite example of what seems a relevant performance error stemmed from a discussion of the movie *Dodgeball*, where it is claimed “If you can dodge a wrench, you can dodge a ball.” During discussion, X suggested we play dodgeball. Y responded “But I can’t dodge a wrench.” X noted Y may yet dodge a ball. Y conceding the error. [↑](#footnote-ref-56)
57. There is, of course, a distinction between rules of a formal system and normative lessons associated with accepting a system. (Harman, 1986) observed believing a contradiction should not require believing everything but took this to suggest logic is no normative guide for belief. (Field, 2009) and (MacFarlane, 2004) have argued persuasively in favor of bridge principles linking logical theories with belief and normativity. I am not so pessimistic as Harman. [↑](#footnote-ref-57)
58. Compare (Kripke, 1982, pg. 37): “The point is *not* that, if I meant addition by ‘+’, I *will* answer ‘125’, but that, if I intend to accord with my past meaning of ‘+’ I *should* answer ‘125’…The relation of meaning and intention to future action is *normative*, not *descriptive*.” [↑](#footnote-ref-58)
59. An option we do not pursue is replacing acceptance with a less restrictive attitude. Worth pointing out is that replacing acceptance with a *stronger* attitude, e.g. belief, knowing, would seem to lead back to adoption problems. [↑](#footnote-ref-59)
60. Is it not the case that guidance by a rule implies implicit acceptance? If so, dropping explicit acceptance while requiring guidance involves implicit acceptance, and *a fortiori*, acceptance. This is incorrect. An agent might be guided by a rule but not regularly behave according to it. In such a case, guidance and implicit acceptance come apart. [↑](#footnote-ref-60)
61. With respect to flying a plane, see (Dreyfus & Dreyfus, 1980; 1986). [↑](#footnote-ref-61)
62. Though even this much is contentious. (Stanley & Williamson, 2001, pg. 411) observe ascriptions of knowledge-how in English contain embedded questions, then claim since our best semantic theories of questions require attributing propositional knowledge, ascriptions of know-how also attribute propositional knowledge. I, like (Devitt, pg. 89, fn. 2), am suspicious of this argument. Moreover, (Rumfitt, 2003)’s observations that French does not embed questions in know-how ascriptions in the manner required by Stanley and Williamson to undermine know-how (ascriptions relate individuals to activities, not propositions) seems to sharply constrain the reach of their argument. [↑](#footnote-ref-62)
63. (Devitt, 2006, pg. 46) [↑](#footnote-ref-63)
64. Chomsky is the obvious inspiration for Devitt’s claims, though there are several differences between Chomsky’s and Devitt’s respective proposals. The main difference – for our purposes – seems to be that Chomsky is committed to rules governing language being propositional, while Devitt allows their being know-how. [↑](#footnote-ref-64)
65. (Ryle, 1945, pgs. 6-7) also claims Carroll’s regress can be avoided by dropping relevant propositional knowledge. (Devitt, 2006, pgs. 46; 50; 107-8) claims Carroll’s note shows ‘thinkers’ must have non-propositional know-how. [↑](#footnote-ref-65)
66. Thanks to Sean Ebels-Duggan for this insight. [↑](#footnote-ref-66)
67. E.g. crying, adjusting breathing rates (human infants exhibit diving reflexes), developing language, etc. [↑](#footnote-ref-67)
68. Besides the obvious need for more detail, one might wonder why blind evolutionary pressures should be trusted to preserve truth rather than, say, usefulness or expediency. [↑](#footnote-ref-68)
69. (Wright, 2004, pg. 163-4). [↑](#footnote-ref-69)
70. Whether the normativity envisaged here is satisfactory is an open question, and clearly relevant to whether the parallel objection to the implicit acceptance proposal has teeth. Simply put, if normativity understood here requires more than the current proposal offers, then motivation for maintaining guidance of inferential practices wavers. The case in favor of this proposal over the implicit acceptance proposal will then rest on balancing other costs and benefits. [↑](#footnote-ref-70)
71. Lack of data seems due to lack of interest rather than negative results, though see (Geurt, 2003), (Crain & Khlentzos, 2008) for recent results suggesting just such a developing logical competence. [↑](#footnote-ref-71)
72. We need not extend ourselves too much in this hypothesis, but it is hard to resist given Devitt as our inspiration. Devitt restricts his claim to linguistic competence as knowledge-how, but we might apply this notion to logical competence, postulating a universal logic on par with Chomsky’s universal grammar. While a plausible extension of the current proposal, one might balk at analogizing logic and language so. Universal grammar gains much plausibility from observing linguistic competence is robust in adult speakers, and failures of, say, students to correctly identify instances of valid inference patterns does not suggest robustness. While I think these challenges can be met, I do not have the space to discuss them here. [↑](#footnote-ref-72)
73. In symbols: (P&~P) |- Q. While relatively straightforward to convince students that once you have a contradiction on your hands something has gone wrong, it is not so easy to convince them inferring anything at all is a reasonable next step. To be fair, this is typically overlooked in introductory texts, where students are encouraged to restrict entailments to a target; see (Hardegree, 1999), (Bergmann, Moor, Nelson, 2013) as representatives. [↑](#footnote-ref-73)
74. See (Priest, 2014, pg. 10) for a similar observation concerning *logic utens*, or the way people - actually - reason. [↑](#footnote-ref-74)
75. (Quine, 1970, pg. 386). [↑](#footnote-ref-75)
76. (Chomsky, 1968) anticipates quite a few. [↑](#footnote-ref-76)
77. (Quine, 1970, pgs. 387-8) admits as much, adverting to sets of verbal dispositions – physical states of agents – to explain linguistic behavior and language generally. [↑](#footnote-ref-77)