Scrutinizing Anti-exceptionalism

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Abstract

In this paper, I argue against present accounts of anti-exceptionalism about logic, while preserving some of their insights. I will do that by offering objections against the anti-exceptionalists' claims that revisions happen in the same way in sciences and in logic, and that the methodology of logic involves abduction simpliciter. I propose a new account of theory divergence for logic with anti-exceptionalist aspects which also preserves exceptionalism on some level while considering the role of metalogic in the exceptionalist/anti-exceptionalist debate.

1 Introduction

Anti-exceptionalism about logic has recently received more attention in the literature. It is the thesis that

> Logic isn't special. Its theories are continuous with science; its method continuous with scientific method. Logic isn't a priori, nor are its truths analytic truths. Logical theories are revisable, and if they are revised, they are revised on the same grounds as scientific theories. (Hjortland 2017, 631)

There has been numerous debates on whether logic's methodology is comparable to that of science. Anti-exceptionalists hold this thesis comes along with the assumption that science utilizes abduction (in particular, inference to the best explanation as its methodology). The traditional exceptionalist

approach captures the a priori status of logic, usually accompanied with the view that logic is immutable. As most important philosophical questions, this one has reached the stage at which its discussion is proceeding piecemeal, in terms of particular examples, arguments and counter-arguments. Even though this article is intended as a contribution to counter-arguments, the view I am defending here will allow for the use of abduction in a limited range of cases.

Quine (1951) famously questioned the a priori status of logic. The quote below from Quine best describes the concept of revision used in the mainstream anti-exceptionalism:

> no statement is immune to revision. Revision even of the logical law of the excluded middle has been proposed as a means of simplifying quantum mechanics; and what difference is there in principle between such a shift and the shift whereby Kepler suspended Ptolemy, or Einstein Newton, or Darwin Aristotle? (Quine 1951, 43)

Before the advent of the term "anti-exceptionalism", there has been a similar debate among philosophers during the 70s. Haack (1996) is notable for collecting the pertinent views and taking a stand on the debate. Susan Haack proposes a formal criteria for rivalry in Hack (1996). In addition, Aberdein and Read (2009) suggest a newer criteria for discerning rival logical traditions. The discussion around the criteria of rivalry will go beyond the scope of this paper.

To take a fair stand on the anti-exceptionalism debate, we need to explain clearly what anti-exceptionlism is. This is what I will undertake in section 2. In section 3, I will highlight a requirement which I argue is a prerequisite of anti-exceptionalism, offer some objections to the requirement, and suggest other objections to assuming revisions in science and logic alike. Furthermore, in section 4, I give my own model of logic, demonstrating how it dovetails with abduction while taking into account the role metalogic can play, and I will respond to some possible objections. Finally, I will conclude the paper in section 5.

2 What Is Anti-exceptionalism?

In this section I will elaborate on what anti-exceptionalism refers to, and what it requires.

2.1 A Summary of Different Accounts

Timothy Williamson coined the term *anti-exceptionalism about logic* in Williamson (2007). However, Quine is the first one who has been famous for holding the view (Quine 1951; Quine and Ulian 1970; Quine 1986). Other prominent advocates are Maddy (2002), Priest (2006, 2014, 2016), Read (2017), Russell (2015), Burgess (2015), Hjortland (2017), and Williamson (2013, 2016, 2017). Following Russell (2018), I would classify any position which holds logic is not exceptional as an anti-exceptionalist view. Such an account con-

sists of believing in logic being a posteriori, or contingent, or non-normative, or requiring an abductive methodology. On this account it is sufficient for one to hold at least one of the mentioned requirements to be called an anti-exceptionalist. You might believe that evidence for a logic should be a priori, but the epistemology for logic is abductive. That said, anti-exceptionalism about logic would be an extremely diverse family of views according to which logic is not special as the main kernel. Despite this classification, the majority of the advocates share these two tenets:

1. That logic does not require its own epistemology, and

2. its methodology is continuous with science.

Williamson (2017) best describes this, when he says: "The abductive methodology is the best science provides, and we should use it" (Williamson 2017, 340). Hereafter, I will call this position, *abductive anti-exceptionalism*.

Anti-exceptionalists may come from different metaphysical schools. Whereas Williamson holds a realist metaphysical background, Quine is rather anti-realist with regards to the subject matter of logic. So in general anti-exceptionalism is independent of metaphysical claims. Anti-exceptionalism would be consistent with realism, psychologism, non-cognitivism, neo-Kantianism, and conventionalism (Cohnitz and Estrada-González 2019, 149).

In contrast to anti-exceptionalism, exceptionalism, the opposite view, is the dominant view in philosophy of logic, which was born concurrently with logic itself. Frege and Carnap are eminent proponents of the view. More

recently, Boghossian (2000, 2001, 2003) and Peacock (1987, 1993, 1995) have defended exceptionalism.

2.2 Abductive Anti-exceptionalism

Let me turn now to the abductive anti-exceptionalism, since it will be the main focus of this paper. All abductive anti-exceptionalists believe that abduction explains how logic makes progress, and argue for their favored logic on that basis. Williamson describes the abductive method as below:

> [S]cientific theory choice follows a broadly abductive methodology. [...] Scientific theories are compared with respect to how well they fit the evidence, of course, but also with respect to virtues such as strength, simplicity, elegance, and unifying power. We may speak loosely of inference to the best explanation, although in the case of logical theorems we do not mean specifically causal explanation, but rather a wider process of bringing our miscellaneous information under generalizations that unify it in illuminating ways. (Williamson 2017, 334)

As we have seen, for abductive anti-exceptionalists, theory selection in logic, like in science, involves a balance of adequacy to the data, simplicity, consistency, power, avoidance of ad hoc elements, and etc. as criteria for theory choice. Based on the criteria, anti-exceptionalists argue in favor of their favored logic. Priest (2016) applies this method to argue for a non-classical

(paraconsistent) logic. Hjortland (2016) uses it to motivate his global pluralism. Finally, Da Costa and Arenhart (2018) argue that if we adopt a thorough anti-exceptionalist view, local logical pluralism will account better for the data. Aberdein and Read (2009) is also a good instance. They examine four reform proposals. Those are systems which are rivals for classical logic, namely intuitionistic logic, quantum logic, relevant logic, and paraconsistent logic. They clearly associate logical theories with observation theories in science and they seem to take the data to be the vernacular inferences. They claim that in the case studies they have considered, the time has not yet come for the revision to take place as the programs are still in progress, and they are inclined to accept a kind of global pluralism to be the preferable position to take.

Here we should distinguish between the normative methodological claims on how logic should progress, and the descriptive claim that how logic actually proceeds. Anti-exceptionalists seem to make both kinds of claims. Read (2019) has argued that there are a lot of cases within history of logic that shows abduction is how logical theory choice proceeds. On the other hand, Williamson, Priest, Hjortland, Da Costa, and Arenhart all claim that in addition to the descriptive claim, based on their arguments how logic should proceed is the passage they have argued for. I will put forth some objections to these claims in section 3.2.

There is a disagreement between anti-exceptionalists regarding what constitutes the data. According to some anti-exceptionalists, the pertinent data

are "our intuitions about the validity or otherwise of vernacular inferences" (Priest 2016, 41). For Williamson, on the other hand, the data are all the things that we know. Da Costa and Arenhart (2018) argue that this schism regarding the data means that anti-exceptionalism provides support for local pluralism.

> Given that the notion of consequence may be specified in distinct directions, for distinct purposes, involving distinct relevant choices of logical vocabulary, there may be distinct sets of data once this first stage is performed, and distinct systems may do better on each (Da Costa and Arenhart 2018, 12).

Hlobil (2020), on the other hand, traces different data to what he calls rival conceptions of logic. Conceptions of logic describe what logical theories in fact theorize.

Logical abductivism, the thesis that theory choice in logic occurs by abduction, can be seen as a promising option for anti-exceptionalists. It is in fact a convenient way for anti-exceptionalists to explain revisions in logic. Logicians adopt a new logical theory, only if the theory does better in enough important respects than their old theory. The following requirement expresses a rather weak necessary condition for abductivism in logic:

> *Requirement* $\mathscr{A}$: logic $\mathcal{A}$ does better than logic $\mathcal{B}$ and will eventually replace it, only if ceteris paribus, logic $\mathcal{A}$ solves the problems that logic $\mathcal{B}$ solves, and on top of that does better with respect

> to a problem which logic $\mathcal{B}$ does not solve.

Anti-exceptionalists often argue in this way:

> the three-valued logic has all the virtues of classical logic: it explains the presence of the various logical properties, does so in a simple, unified fashion etc. but it also accounts for some difficult cases where classical logic says nothing. So on balance she thinks it better... (Russell 2014, 172).

By *problem,* I mean lack of satisfying an abductive criteria, or solving important logical puzzles. Requirement $\mathscr{A}$ clarifies, and simplifies what anti-exceptionalists mean by revisionism. Note that being revisable, and a posteriori are two independent properties for logic. Logic can be revisable, but a priori. Equally, logic might be a posteriori, but unrevisable (Cohnitz and Estrada-González 2019, 141).

If logic is revisable in the sense that anti-exceptionalists suggest, requirement $\mathscr{A}$ will hold, since it is basically the heart of Priest's model of rational theory selection.[1] Priest has argued for revising classical logic based on a quantitative model. It has also qualitative versions. In addition, if requirement $\mathscr{A}$ holds, logic is revisable. Requirement $\mathscr{A}$ is a necessary requirement for abductive anti-exceptionalism. Requirement $\mathscr{A}$ follows from incorporating abduction in the methodology of logic. As a result, anti-exceptionalists expect that a logic which does best on abductive grounds, will eventually replace the prevalent logic.

In the next section, I will offer some objections to *Requirement* $\mathscr{A}$ and show that it cannot be a good description of how the development in logic actually progresses. Now that we know what anti-exceptionalism refers to, and what it requires, we will be able to take a closer look on its flaws in the next section. I will follow two lines of objections. First, I rebut Requirement $\mathscr{A}$. Second, I look into the differences between revisions in science, and potential revisions in logic.

3 Objections to Abductive Anti-exceptionalism

There are several lines of objections to the involvement of abduction in the methodology of logic. Resnik (2004), Hlobil (2020), Shapiro, and Rossberg (2017) are notable for this. Stewart Shapiro and Marcus Rossberg have described the underlying differences between disparate abductive anti-exceptionalist accounts as disagreeing on what logic and logical consequence are, what does it mean for logic to be continuous with science methodologically, and what anti-exceptionalists intend by "sciences", to begin with. I will assume anti-exceptionalists can address these questions and carry on the other possible objections.

3.1 Requirement $\mathscr{A}$

As mentioned in the previous section, Requirement $\mathscr{A}$ is clearly a necessary condition of an abductive methodology. Here, I will rebut Requirement $\mathscr{A}$ as

a requirement for the methodology of logic. This will undermine abductive anti-exceptionalism.

My first line of argument is that applying this requirement in the theory choice in logic is too simplistic. It simply overlooks the pros of logics. There might be equally salient logical problems P_1, and P_2 which render Requirement $\mathscr{A}$ indeterminate. In fact, Priest (2016) has explicitly claimed that in case of a tie for best logic, the choice will be indeterminate and this will not be a problem for anti-exceptionalist. Priest (2020) has mentioned that the reason this does not deter the anti-exceptionalists is that this does not happen regularly in science and hence in logic. This may be true for science, nonetheless the fact that even anti-exceptionalists like Williamson, Priest, Hjortland, and Da Costa in spite of agreeing on the criteria for theory choice prefer totally disparate logics/accounts suggest otherwise about logic.

Another concern that arises with Requirement $\mathscr{A}$ is that it overrates the practical applications of logic, such as what Williamson calls being fundamental to different domains of knowledge. Williamson has a striking argument in which he uses the quality of being fundamental as a pro for classical logic. According to him, classical logic is fundamental, since it is integral to mathematics. One can suggest an argument in line with his argument, by substituting another characteristic in place of being integral to mathematics, claiming that the new characteristic is as essential. As an instance, consider Inductive Logic. One might conclude that since inductive arguments are essential to science, as classical inferences to mathematics, it should be con-

sidered using Williamson's term fundamental. Again, this kind of pluralism might be a promising option here abductively; since it will allow for several applications. However, with the plethora of important applications this will not be an orthodox logical pluralism. To put it more clearly: If logic L_1 is necessary to the practice of domain D_1 this will be considered an advantage in its favor. If logic L_2 is necessary to the practice of domain D_2 that will be equally considered an advantage in its favor. If logic L_n is necessary to the practice of domain D_n that will be considered an advantage in its favor. According to abduction, we will have to consider an unorthodox extreme pluralistic account of logic. An account which is not an orthodox pluralism, but it is all about pragmatics, and it violates topic-neutrality. This leaves us with an account which nobody likes. Therefore, to maintain abduction as a part of the methodology of logic we have to either rule out practical applications as a criteria, or embrace meaning variance.[2]

To sum-up, despite having abductive motivations in mind, scoring a logic best based on the overall criteria for theory choice would face serious flaws, since it is too simplistic for logic, and matters cannot be settled simply based on practical applications of logic. Now, one might object that if we restrain the subject-matter of logic to natural argumentation, my argument might fail. I will respond to this objection in section 3.3.

3.2 Revision in Science vs. Revision in Logic

Anti-exceptionalism claims that there is an analogy between revisions in logic and science. This analogy is explicit in Read's, Priest's, Williamson's and Hjortland's works. In this section, I argue that this analogy is misleading. The underlying idea behind my argument is that the developments in logic are different from science. I use the terms 'consensus shift' to describe a change in consensus and 'revision' to describe a widely accepted change in a theory. I do not use consensus in a strict sense here; I merely mean that a theory is generally accepted and taken for granted in a discipline. I take it that even though disagreements are inevitable in science, they are different from disagreements in philosophy and logic.

There are three aspects of logic in which logical theories may compete, and be revised. These stem from what we might consider the subject matter of logic:

1. the mathematical frameworks
2. the conception of validity
3. logical vocabulary

The first aspect refers to the formal aspects of logic. This includes features like soundness, completeness, categoricity, strength, subformula property and etc. The second aspect revolves around theorizing validity. Many consider validity and logical consequence as the subject matter of logic. Nonetheless,

there is no consensus among logicians what logical validity is. Like validity, there is no agreement on logical constant's demarcation.

I will show now that for all aspects how logic advances differs from science. With respect to the formal aspect, logic is considered as a part of mathematics. In this respect, logic moves forward as part of mathematics. And, evidently it does not resemble science at all; unless we consider mathematics a science. Apparently Williamson does this. Such a move seems to be not acceptable for all. There are some philosophers like Lakatos[3] who see mathematical methodology in line with science in that both are a posteriori, and revisable. At the very least anti-exceptionalists like Williamson will carry the burden of proof that a transfer of Lakatos's methodology of research programs from science to modern mathematics is possible[4]. As Corfield (1998) has mentioned "any model of the development of modern mathematics will require more sophistication than a simple transfer of Lakatos's methodology of research programs from science to mathematics" (Corfield 1998, 297-298).

The second face of logic is more philosophical. The discussion around which logic captures validity better is a philosophical discussion. So, if there is some answer to this, it will be through a pertinent philosophical discussion. But, if this is so, how could consensus shifts and revisions happen? Consider the case that philosophical discussion D leads to the proposition that L is the best logic, and later, another philosophical discussion E leads to logic J being the right logic, based on the abductive criteria. Assume the metalogic behind the discussions is M[5]. If we want to revise L, by J, we have to

consider revising M by J, as well. It follows that arguing by logic J, logic J is the best logic. Therefore, the dilemma becomes more complicated with M entering the game. We have more than three options now. Choosing either L, J, or M. We have the options $L \vee J$[6], $M \vee J$, $L \vee M \vee J$, or staying put, as well. This becomes more intricate when we are comparing more than two logics. Priest (2020) has claimed that this problem won't be prevalent, as it is not prevalent in science. The lack of agreement between anti-exceptionalists proves this to be wrong. According to Priest's solution, we can either stay put with the already accepted logic (which is not clear which), or accept the disjunction of logics. But, some of the positions are not specific logics. They are rather an account. For instance, Da Costa, and Arenhart's local pluralism is rather an account. It is not clear what a disjunction would be like when we have local pluralism as a disjunct.

This is a similar problem to the well-known problem of logical partisanhood first introduced by Jack Woods. It requires "both the proposed alternative and our actual background logic must be able to agree that moving to the alternative logic is no worse than staying put" (Woods 2018, 1).

So far, I have shown that anti-exceptionalism fails to explain how logics compete over formal aspects, and capturing validity without facing several worries. It remains to explore how anti-exceptionalism looks at competing accounts of logical vocabulary. Here again the problem of background logic pops up: Suppose an anti-exceptionalist is deciding between set S_1 of logical constants and set S_3 of logical constants based on abductive criteria. Assume

that the background logic she is using employs set S_2 of logical constants. The set S_2 will enter the competition. The anti-exceptionalist has to show that using S_1 as the background set, S_3 is the best choice. She also has to show that using S_2 as the background set, S_3 will be inferred as a better logic on abductive grounds. The worry that emerges now is that while choosing between S_1, S_2, and S_3 what background vocabulary the logician may use. Is it one of the aforementioned sets, or is it a new set S_4? If it is one of the mentioned sets, it could be considered a case of begging the question, and by favoring a different set regress threatens. Another worry is that by changing the background set the anti-exceptionalist is talking past herself while deciding between the three options.

3.3 Potential Objections

A potential objection I discuss in this section is that one might argue if we limit the subject matter of logic to natural argumentation, the unfavorable consequences of Requirement $\mathscr{A}$ might not arise. Let's see what happens, then: As most logicians admit there is no single logic which would be the best with regards to modeling the natural argumentation. Each logic developed for this purpose has its own pros and cons. Natural language connectives are a lot more complicated and elusive than their logical counter-parts. Glanzberg (2015) argues that logic cannot be dictated from the semantics of natural language. Glanzberg mentions:

> We only get to logic proper by a significant process of identification, abstraction, and idealization. We first have to identify what in a language we will count as logical constants. After we do, we still need to abstract away from the meanings of non-logical expressions, and idealize away from a great many features of languages to isolate a consequence relation. This process takes us well beyond what we find in a natural language and its semantics. We can study logic by thinking about natural language, but this sort of process shows that we will need some substantial extra-linguistic guidance—some substantial idea of what we think logic is supposed to be—to do so. *We do not get logic from natural language all by itself.* (Glanzberg 2015, 71-72, my emphasis)

It follows that we cannot find *the* logic(s) when limiting our interest solely to natural language.

4 Inclusive Anti-exceptionalism

In this section, I will present my own view on theory divergence in logic which will eventually incorporate abductive anti-exceptionalism about logic as a part. I will preserve what is plausible about anti-exceptionalism while avoiding its pitfalls and show that anti-exceptionalism and exceptionalism can be reconciled locally. I will present my framework using a sequent calculus structure. But I claim that my model works also for a natural deduction

setting. A rewarding aspect of my view is that it would fit to both major exceptionalists accounts about logical evidence, namely rationalism and semanticism. In short, semanticism is the view that understanding the meaning of logical sentences is sufficient evidence for regarding that logical sentence true[7]. On the other hand, logical rationalism subscribes to the view that we discern the truth of logical sentences, unmediated through intuition.

4.1 Logical Traditions

Despite all the mentioned objections to abductive anti-exceptionalism, there are genuine disagreements within some logical traditions which pave the way for some local revisions. These kinds of disagreements are only within the same family of logics which I call a *logical tradition*. I will give an exact definition for logical traditions in the coming lines. For instance, consider the following disagreement case on modality. Burgess (1999) describes a real instance of possibility of systematic revisions within the tradition of modal logic:

> While the argument for the soundness of $S4$ as a demonstrability logic given there seems as compelling as an "informally rigorous" argument can be, there is no real argument for completeness, which remains an open question. It therefore remains conceivable that the right logic is something stronger than $S4$: that is something intermediate between $S4$ and $S5$, such as the

> logic called Grz after Grzegorczyk and the logic that ought to be called McK after McKinsey. (Burgess 1999, 82)

From this passage, it is clear how natural it is to ask about which modal logic is the best. Since the completeness for S4 had not been proven back then, logicians were looking for stronger logics. That makes it possible to use abduction within the tradition of modal logic, which may result in revisions within modal logic. However, we cannot conclude that such revisions and consensus shifts in particular logical traditions are revisions and consensus shifts in logic as a whole enterprise. I will develop a framework to argue that such revisions are limited to logical traditions. I will argue that the local disagreements cannot go further than within logical traditions. For this purpose I will adopt the traditional classification of logical families. This is specifically the families philosophical logicians use everyday, such as classical, modal, relevant, conditional, intuitionistic, many-valued, linear, non-monotonic, and fuzzy. Furthermore, by a sequent calculus being equivalent to a Hilbert-style axiomatization, I mean the consequence relations are equivalent hereon.

Definition 1. [8]The formal representation of the L-logical tradition is a set of sequent calculus structures which are equivalent to at least one Hilbert-style axiomatization of a logic in the family of logics L. Here, L refers to a logic in a general sense which can be picked out using the traditional classification for logical families. In particular, L might be classical, intuitionistic, modal, relevant, paraconsistent, and etc.

So what represents a logical tradition is the set of all possible sequent calculus presentations of a logic. For instance, consider classical logic's sequent calculus. LK, and G3cp are notable presentations of it. Their formal affinity is that although there are different axiomatizations for classical logic, what all these sequent calculi have in common is that each of them are equivalent to at least one classical axiomatization, e.g. LK is equivalent to K. Moreover, an intuitionistic logical tradition, for example, contains LJ, G3ip, and other useful intuitionistic sequent calculus systems. Hence, by definition, the classical logical tradition is $CL = \{LK, G3cp, G3c, G0c, GM, ...\}$, and the Intuitionisic logical tradition is $IN = \{G3ip, G4ip, LJ, G3i, G0i, GN, G3im, ...\}$.

The philosophical affinity that all elements of a particular logical tradition have is representing and capturing our corresponding intuitions[9] if we are rationalists; and our understanding of the meaning of constituent parts, if we are semanticists regarding logical evidence. That said, logicians have many logical intuitions which mostly have been already represented in the frameworks they have developed. There is always room for a new kind of intuition. As for instance, quantum logic demonstrates a new kind of logical intuition which logicians have not had before the discoveries in modern physics. By the same token, new logical vocabulary may be devised.

Before moving on, I have to clarify a detail of logical traditions. A worry is that it might not be clear for some logics that which logical traditions they belong to. To instantiate, it is not clear which logical tradition intuitionistic modal logic is associated with: Modal logical tradition, or Intuitionistic logi-

cal tradition. There are numerous cases like this. I take them to be a member of both logical traditions, as they have already both kinds of properties, i.e. they will represent both kinds of intuitions and will contain both kinds of logical vocabulary.

My framework is consistent with domain-specific logical pluralism (DLP) which is a kind of logical pluralism endorsed by Lynch and Cotnoir.[10] This is roughly the view that different logical systems are appropriate for different domains or different contexts. While some of the DLP adherents subscribe to pluralism about truth, Keefe (2018) has shown that this kind of logical pluralism is independent of pluralism regarding truth (which very roughly states that the truth conditions of propositions vary with the type of propositions and the domain/context they belong to).

My framework is also consistent with the more plausible Keefe (2018) account. She has developed a context-based framework which is a treatment of DLP that adopts the *relative validity* thesis[11], according to which arguments are valid relative to their context. That said, I do not make the strong claim that certainly all of the logical traditions which various logicians adhere are correct. Adherents of various forms of DLP might find my view more compelling.

4.2 Revisions within and between logical traditions

Now let's talk about how revisions might happen in the framework I have built. I will show that the possibility of revision will depend on the metalogic

logicians use.

4.2.1 Revisions within a logical tradition

Here I will motivate the possibility of revision in a logical tradition, and elaborate on the extent to which it might happen. I argue that logical traditions allow revision within them, and this is due to the possibility of disagreements when metalogic is kept fixed. Changes within a tradition have occurred before, and will possibly occur a lot in the future. Moreover, I claim that the revisions here, are what makes local progress in the development of logic possible. By revision within a logical tradition I mean the possibility of eliminating an element of a logical tradition and substituting it by another element.

Motives for changes within a logical tradition may be merely formal, or philosophical. The formal motives as suggested by their names are related to proof theoretical features *ab initio*, e.g. to make cut-elimination easier, but when these kinds of revisions are implemented, they might trigger logicians to change the rules they are using, and thus modify meaning indirectly (if one holds that meaning is determined by rules). To illustrate, albeit not having the identical operational rules, G3ip, and G4ip are considered rivals:

> It was discovered in Hudelmaier (1992) and in Dychkoff (1992) that the left implication rule of G3ip can be refined into four different rules, according to the form of antecedent A of the principal formula, to the effect that proof search terminates. The refine-

> ment gives a calculus, designated as G4ip [...]. (Negri, von Plato, and Ranta 2001, 122)

In this case, although it is not clear whether revision has happened; nonetheless there is an apparent rivalry. While the rivalry is proof theoretically motivated, it has changed rules consequentially, so it should not be dismissed as insignificant. Obviously there are also purely formal changes that have no further implications.

A famous case in the literature where apparently revision has actually happened is modal logic. The question of which modal logic is correct have certainly caused a debate among philosophers. In modern times it has started with Lewis proposing S2 as the true logic. Prior and his contemporaries, on the other hand, used to believe Q is the right quantified modal logic which captures our modal intuitions. Not much later, logicians came to believe that system $QS5$ and other systems in this ballpark are a better option and it seems that it has led to a revision:

> I want to ask a rather crude philosophical question, namely: is S5, considered straightforwardly as a modal system, the true modal system? Its original inventor, C. I. Lewis, was quite certain that it was not, his view being that the true modal system is the somewhat weaker one that he called S2. I shall maintain that Lewis was right in his negative contention, wrong in his positive. Nor do either S5 or S2 seem to me true when read as tense logics. For both of them contain as a theorem the formula [...] 'If it

> could be that p then it could be that p-or-q', or 'If at some time p, then at some time p-or-q'. And there seems to me to be p's and q's for which this formula is not true. I have already given counter-examples[...]. (Prior 1977, 102)
>
> [...] for only a few minor changes, the very Priorean A is almost exactly the very un-Priorean $QS5$ that spawned Prior's original search. But with these simple changes, driven by the notion of characterization, A retains Prior's key intuitions_ serious actualism and classical quantification theory, in particular_ without the high logical cost of Q. All in all, I think, a much seemlier candidate for Prior's true modal logic. (Menzel 1991, 360)

Here the revision happens based on the abductive grounds of avoiding costs and adequacy to the data (here intuitions). I have claimed here that revisions based on abductive grounds are possible within a logical tradition, and we may agree that we can find genuine cases of them. Micheal Resnik has supported the possibility of logical revision in a logical theory when we keep a significant part of our logic fixed:

> [...] we may be able hold part of logic fixed, while using it to deliberate about changes in other parts. Moreover, through a series of changes in logic we might be able to revise parts that we could not revise initially. (Resnik 2004, 182)

What I have tried to keep fixed here is metalogic, the logical intuitions for ra-

tionalists and meaning for semanticists. No matter what metalogic advocates of a logical tradition hold for making judgments, it should be shared among them. Within a logical tradition the intuitions of logicians will be more similar. Furthermore, the meaning of logical constants should be shared in a logical tradition. No matter what classical system classical logicians advocate, they grasp the classical $\wedge$ the same. *Pace* Paoli (2014), I do not accept the thesis that operational rules are the sole determinant of the meaning of logical vocabulary. If it was so, the meaning of logical vocabulary would vary within a logical tradition. I hold that structural rules may also play a part in the meaning of logical vocabulary. This is not the place to go into the details of how an account of meaning should be to keep the meaning of logical constants shared within elements of a logical tradition. For now this will remain an open question. An account in line with global meaning of a logical connective which is inclusive enough to keep the meanings in logical traditions shared might do. Global meaning of a connective is the class of all derivable sequents which contain that connective (contain here might mean having the connective as the sole connective or it might not be the only connective) (Paoli 2014, 441). If we use the present account of global meaning without any modifications, the elements of logical tradition which do not share the consequence relation will not share the meaning.

Thinking about theory divergence requires one to ascertain that there is no talking past each other in case two logicians advocate a particular logic. I claim that holding two distinctive metalogic while talking about the same

logical tradition is odd. Let's see if two logicians, of whom, one prefers the sequent calculus L_1, and the other works with sequent calculus L_2, whereL_1 and L_2 are presentations of a logic L, talk past each other. Consider for example a user of LJ, and a user of G3ip. To assume that the users of LJ operational rules, and the users of G3ip are talking past each other would be extremely bizarre. As mentioned before, when making judgments about a logical tradition L, we are using the same metalogic we apply when making judgments and compare logical traditions. That said, logicians might have disputes here about which subsystem would better represent the logical tradition. Abduction might be practical for choosing operational rules, and addressing various concerns in this context. Moving outside a logical tradition in the next subsection, I will claim that disagreements are possible as long as we continue with our metalanguage, and metalogic.

4.2.2 Revisions between logical traditions

The main question that I address here is whether divergence is possible between logical traditions. I claim that before responding to this question we need to take a stand on what metalogic we are using, and it is vital to settle whether we are committed to using the same metalogic when making judgments about distinct logical traditions. Alongside Resnik (2004), I broach an important distinction here. I distinguish a logical framework, and logicians' judgments regarding logical frameworks. Logicians use a metalanguage, and a metalogic when reasoning about logics. This is what makes disagreement

among them possible, but at the same time I will show that it makes revisions impossible.

Two kinds of views on metalogic are imaginable; the first group which are by far more established are the ones which regard the metalogic of alternative logics to be first-order logic with set theory.[12] In contrast, there are philosophers like Weber, Badia, Girard, and Williamson who claim that it is better to stick to a non-classical metalogic while making judgments about those logics. Williamson believes that metalogic is not a neutral arbiter, and fundamental logical disputes will emerge at the meta-level (Williamson 2017). Hence, it is better to stick to a non-classical logic as our metalogic if we are an advocate of non-classical logic. Weber, Badia, and Girard hold that "when we write down the orthodox semantic clauses for a logic, whatever logic we presuppose in the background will be the logic that appears in the foreground" (Weber, Badia, and Girard 2016, 533).

This debate won't really matter for within logical traditions; as mentioned before, it is rather amiss to claim that logicians of a particular tradition use different metalanguage/logic to make judgments about systems within traditions. However, between logical traditions this becomes an important issue, and it should be settled before deciding whether any revision, including revision by abduction is possible in logical traditions. If the metalogic of logicians who wish to revise are different, the crucial problem with any kind of revision is talking past each other. Hence, advocates of the sameness of logic and metalogic for making judgments (e.g. Williamson) cannot argue for a

revision without talking past each other. On the other hand, if the metalogic is shared among logicians, they will face the famous regress problem:

> Suppose someone is considering a change in logic, because less drastic measures are not working. Presumably the troubled theorist would follow the model for any change in the web. He would replace the old logic with the new one and see how it comes out. That is, the theorist would examine the consequences of the change in logic for the proposed new web of belief. Consequences? Which logic do we use to assess the consequences of different logics? Is there a correct logic for that, and is this super-logic also just a bunch of nodes in the current web? Regress threatens. Is the super-logic analytic, a priori, or incorrigible? (Shapiro 2000, 338)

Resnik believes this kind of objection holds even when we are not considering Quine's web of beliefs:

> Although Shapiro directed his objection against Quine's suggestion that even the laws of logic can be revised to reconcile one's system of belief with recalcitrant experience, the objection applies to any deliberation about revising logic. For it will involve considering the gains and losses arising from the revision. (Resnik 2004, 182)

Priest (2020) has recently proposed a way to apply abductivism to the logic

of abduction. I have discussed this and cast doubt on his proposed solution in section 3.2.

To conclude, when making judgments logicians are not talking past each other so long as they stick to the same metalanguage/logic, but even if sticking to the same metalogic, regress threatens. I finish section 4 by discussing the potential pitfalls of the framework I have developed.

4.3 Possible Objections

As briefly stated before, a potential objection to my model is that some of the logical traditions have overlaps which make it difficult to decide which tradition the overlapping part belongs to. For example, consider a modal nonmonotonic logic. It is possible that a modal nonmonotonic system compete with another nonmonotonic system which is not modal. Shouldn't the traditions be revised by the overlapping parts? This is similar to the problem of mixed inference for DLP which crudely states the logic appropriate for an inference which has premises from various distinct domains should revise the logics corresponding to those domains. As a rule of thumb, we might turn to the definition of logical traditions and decide which tradition the overlap mainly belongs to. A modal nonmonotonic logic, in spite of having modal connectives, will be different from orthodox members of the modal tradition in being nonmonotonic. Moreover, according to the definition of a modal-tradition, it should be equivalent to a Hilbert-style axiomatization of modal logic. Given that, I don't think logicians would like the idea of considering

the corresponding axiomatization of a nonmonotonic logic an axiomatization for modal logic. At least for this example, it seems it sounds more orthodox to consider this logic an element of the nonmonotonic family. Since logical practice is involved in the definition of logical traditions, it can help us decide regarding the overlaps in many cases.

The last line of objection that I consider is the same objection which was stated against Kuhn's incommensurability thesis. Kuhn's views famously has challenged the traditional views on scientific change and rationality. One might worry that this carries over to my view regarding logic. A result of Kuhn's model is that pardigm-choice in science is not rational. By the same token, a consequence of my views is that theory choice in logic is not rational unless logicians from different logical traditions use the same metalogic, and they overcome the regress problem mentioned in section 4.2.2. If the metalogic is not shared and logicians from different logical traditions are talking past each other, traditions will be similar to Kuhn's paradigms. This is not the place to go into that matter further. I have had merely put options along with their pros and cons on the table for further consideration. The situation is novel enough to require a good deal of further thought.

5 Conclusion

I have shown that anti-exceptionalism requires a condition which is too simplistic, and disregards the practical applications of logic. In addition, I have

argued that no matter what we consider the subject matter of logic, the analogy which anti-exceptionalists make regarding logic and science is false. In the second half of the paper, I have suggested a means for preserving abductive revisionism within logical tradition. Although restricted to logical traditions, my framework shows that there is a level in which we can reconcile anti-exeptionalism with major exceptionalist views. I have focused on the role of metalogic in the debate, and have shown that it will pose a new challenge for anti-exceptionalists.

Appendix

The structural and operational rules of LK are given here as an example to make the readers more familiar with sequent calculus (Bimbo 2014, 16):

$A \vdash A$ `(axiom)`

$$\frac{\Gamma \vdash \Delta}{\Gamma, A \vdash \Delta} K \vdash \qquad \frac{\Gamma \vdash \Delta}{\Gamma \vdash \Delta, A} \vdash K$$

$$\frac{A, A, \Gamma \vdash \Delta}{\Gamma, A \vdash \Delta} \vdash W \qquad \frac{\Gamma \vdash \Delta, A, A}{\Gamma \vdash \Delta, A} W \vdash$$

$$\frac{\Gamma, A, B, \Delta \vdash \Theta}{\Gamma, B, A, \Delta \vdash \Theta} C \vdash \qquad \frac{\Theta \vdash \Gamma, A, B, \Delta}{\Theta \vdash \Gamma, B, A, \Delta} \vdash C$$

$$\frac{A, \Gamma \vdash \Delta}{A \wedge B, \Gamma \vdash \Delta} \wedge \vdash_1 \qquad \frac{B, \Gamma \vdash \Delta}{A \wedge B, \Gamma \vdash \Delta} \wedge \vdash_2$$

$$\frac{A, \Gamma \vdash \Delta \qquad B, \Gamma \vdash \Delta}{A \wedge B, \Gamma \vdash \Delta} \wedge \vdash$$

$$\frac{A, \Gamma \vdash \Delta}{A \vee B, \Gamma \vdash \Delta} \vee \vdash_1 \qquad \frac{B, \Gamma \vdash \Delta}{A \vee B, \Gamma \vdash \Delta} \vee \vdash_2$$

$$\frac{A, \Gamma \vdash \Delta \qquad B, \Gamma \vdash \Delta}{A \vee B, \Gamma \vdash \Delta} \vee \vdash$$

$$\frac{\Gamma \vdash \Delta, A}{\Gamma, \neg A \vdash \Delta} \neg \vdash \qquad \frac{A, \Gamma \vdash \Delta}{\Gamma \vdash \Delta, \neg A} \vdash \neg$$

$$\frac{\Gamma \vdash \Delta, A \qquad B, \Theta \vdash \Lambda}{A \supset B, \Gamma, \Theta \vdash \Delta, \Lambda} \supset \vdash \qquad \frac{A, \Gamma \vdash \Delta, B}{\Gamma \vdash \Delta, A \supset B} \vdash \supset$$

Notes

[1]His suggested formal model for selecting theories is the following:$\rho(T) = w_{c1}\mu_{c1}(T) + ... + w_{cn}\mu_{cn}(T)$, where T is a theory,$c1$, ... ,cn are the suitable criteria for criteria for theory choice, w_{c1}, ...,w_{cn} are their associated weights, and μ is a measurement function (Priest 2016, 33). This way, by comparing the numbers it can be decided which theory does better.

[2]Meaning-variant logical pluralism is the view that at least more than one logic is correct and the meaning of logical connectives will vary for the logics.

[3]Lakatos view on mathematics could be mostly found in Lakatos (1976).

[4]For the obstacles of this kind of transfer see Corfield (1998)

[5]Note that some philosophers hold that the metalogic should be the same as the logic we favor. See Williamson (2013a).

[6]Let L mean the conjunction of the axioms of L, as Priest (2020) assumes.

[7]See Ayer (1948), Carnap (2002), and Boghossian (1996).

[8]The same definition works for a natural deduction setting.

[9]I'm using the concept of intuition here in the sense that rationalists use. See Bealer (1998) and BonJour (1998).

[10]See Cotnoir (2012), Lynch (2008) for an introduction. For a criticism to some accounts

of DLP, see Keefe (2018). She has developed a context-based framework based on Smiley (1995) .

[11]See (Smiley 1995) for an introduction.

[12]See Kripke (1975), Field (2008) and Beall (2009) for further discussion.

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