

The Argument Scheme-based Approach to Argument Structure

Shiyang Yu

College of Philosophy

Nankai University

Tianjin

P.R. China

shiyangyu@nankai.edu.cn

Abstract: The concept of argument structure is pivotal in argumentation theory and is extensively employed to analyze and describe arguments. However, as indicated in a previous study (Yu & Zenker, 2022), extant strength-based and relevance-based approaches fall short in distinguishing linked and convergent structures. This paper aims to address this gap by proposing a new argument scheme-based approach and demonstrating its validity. After reviewing the presupposition and inconsistency problems of existing approaches, we analyze their origins in-depth, propose the argument scheme-based approach, demonstrate its validity, and discuss its advantages and challenges. Finally, we argue that our approach, rather than diminishing the concept of argument structure, restores it to its rightful theoretical position.

Résumé: Le concept de structure argumentative est essentiel en théorie de l'argumentation et il est largement utilisé pour analyser et décrire les arguments. Cependant, comme indiqué dans une étude précédente (Yu & Zenker, 2022), les approches existantes basées sur la force et la pertinence ne parviennent pas à distinguer les structures liées et convergentes. Cet article vise à combler cette lacune en proposant une nouvelle approche basée sur les schémas argumentatifs et en démontrant sa validité. Après avoir examiné les problèmes de présupposition et d'incohérence des approches existantes, nous analysons leurs origines en profondeur, proposons l'approche basée sur les schémas argumentatifs, démontrons sa validité et discutons de ses avantages et de ses défis. Enfin, nous soutenons que notre approche, plutôt que de diminuer le concept de structure argumentative, lui redonne sa place théorique légitime.

Keywords: argument scheme, argument structure, convergent structure, linked structure, relevance

1. Introduction

Argument structure (or argumentation structure) pertains to how the constituent statements of an argument fit together (Freeman, 2011, p. vii; 1991). According to Snoeck Henkemans (2000, p. 447; 1992; 2001), laying out the argument structure is essential for both “understanding how arguers defend their positions” and evaluating their arguments. Given its importance, argument structure has become a widely employed tool for analyzing and describing arguments (e.g., van Eemeren & Grootendorst, 1992; 2004; Walton, 1996; Govier, 2010; Freeman, 2011). Scholars today typically identify three types of argument structure (albeit with varying terminologies¹), i.e., convergent, linked, and serial argument structures (see Fig. 1).

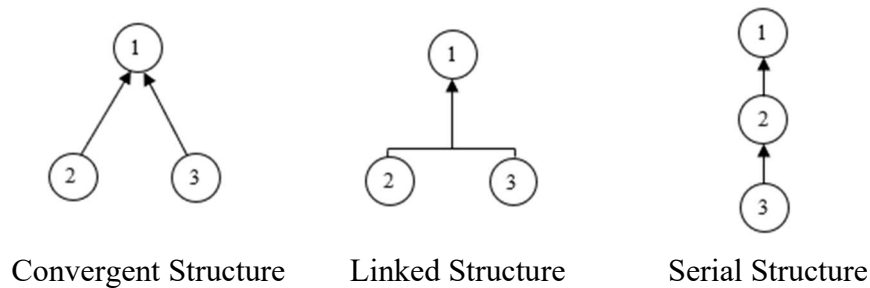


Fig. 1 Three argument structures, with the arrow presenting a supportive relation, and the nodes representing propositions.

These argument structures can be *visually* distinguished by their characteristics: the serial structure involves a *two-level* justification accommodating two conclusions; in a convergent argument, the premises work *separately*, while in a linked argument, the premises work *jointly* to support the conclusion. Despite the clear visual differentiation between convergent and linked argument structures, applying this distinction to real cases can be challenging. Indeed, given the significance and difficulty of distinguishing between linked and

¹ For instance, pragma-dialecticians use the terms ‘subordinative,’ ‘coordinative,’ and ‘multiple’ to refer to ‘serial,’ ‘linked,’ and ‘convergent,’ respectively. However, these terms do not indicate substantial differences (Snoeck Henkemans 2001, p. 101; van Eemeren & Grootendorst, 2004, p. 4).

convergent arguments, Goddu labels it “*the problem of [argument] structure*” (2007, p. 11; *his italics*), hereafter referred to as *the distinction problem*.

The distinction problem arises because the boundary between determining whether premises work separately or jointly to support the conclusion can be ambiguous. For instance, the following argument presented by Freeman (2011, p. viii) can be reasonably interpreted as either convergent *or* linked. After all, *both* interpretations—that the premises support the conclusion jointly or separately—make sense (Walton, 1996, pp. 111f.).

An argument with a controversial argument structure (Freeman, 2011, viii)

His swimming suit is wet.

His hair is plastered down.

Therefore, he’s been swimming.

To solve the distinction problem, scholars correctly recognize the importance of establishing methods to determine whether premises provide joint or separate support for the conclusion. Depending on the method used, current approaches can be divided into *strength-based* and *relevance-based*. While the strength-based approach solves the distinction problem by appealing to argument strength, the relevance-based approach relies on relevance. By comparing the effect of a premise working separately with that of it working together with another premise, both approaches aim to determine whether premises work together to achieve a supposed effect. (However, as we will illustrate in Sect. 3.2, these approaches can only assess whether premises *have to* work together or not to achieve a supposed effect.)

Nevertheless, both approaches encounter several problems (Yu & Zenker, 2022), with two significant problems being particularly noteworthy. *First*, the dominating strength-based approach relies on argument *strength*, which theoretically contradicts the consensus that argument structure is an analytical concept: given that the argument analysis should methodologically *precede* the argument

evaluation, the analysis of argument structure should *not* rely on the outcomes of argument evaluation. The reliance creates the *presupposition problem*, as all tests on the strength-based approach need to presuppose the premises to be true (or acceptable). After all, false (or unacceptable) premises cannot offer any support to the conclusion. However, this is a presupposition that does not hold. Instead, by requiring the premises to be true (or acceptable) for the tests to apply, these tests may not qualify as a strength-based approach, which typically relies on evaluating—rather than assuming—the acceptability of the premises.

Second, both approaches face the *inconsistency* problem, which manifests in two ways. Here we mention one of them, which will be discussed in detail later. As we will elaborate in Sect. 3.2, both approaches depend on comparing what an individual linked premise fails to achieve versus what an individual convergent premise can achieve.² For instance, the relevance-based approach assumes that any linked premise is individually irrelevant to the conclusion, whereas any convergent premise is relevant. However, when a convergent and a linked argument *share* one premise and the conclusion, this assumption entails an *inconsistency*: the same premise becomes both relevant *and* irrelevant to the conclusion.

To develop an approach that can avoid both problems, we propose the argument scheme-based approach to the distinction problem. On the one hand, the presupposition problem is avoided because our approach does not rely on calculating or comparing argument strength, thus eliminating the need to presuppose the truthfulness or acceptability of the premises. By solving the presupposition problem, we reaffirm argument structure as an analytical concept. On the other hand, the inconsistency problem is addressed by focusing on the comparison between linked and convergent *arguments*, rather than between linked and convergent *premises*. By solving the inconsistency problem, we reaffirm argument structure as a description of an entire argument.

² A linked premise refers to a premise within a linked argument, just as a convergent premise refers to one within a convergent argument.

To propose our approach and demonstrate its validity, we begin by reviewing the extant strength-based and relevance-based approaches to solving the distinction problem (Sect. 2). We then discuss their problems (Sect. 3.1), and explore the origins and solutions to the problems (Sect. 3.2). After presenting our argument scheme-based approach, which relies on the number of argument scheme that an argument can instantiate (Sect. 4.1), we demonstrate how this approach avoids the problems that the extant approaches face (Sect. 4.2). The potential difficulties of our approach are also addressed (Sect. 4.3). Furthermore, we argue that our approach, rather than diminishing the concept of argument structure, restores it to its rightful theoretical position (Sect. 5). Our conclusions are presented in Sect. 6.

2. Two approaches to the distinction problem

2.1 The strength-based approach

In (Yu & Zenker, 2022), we identify two approaches for distinguishing between linked and convergent argument structures (i.e., the distinction problem): the strength-based (or support-based) and the relevance-based approaches. Proponents of the strength-based approach argue that varying a premise's status (i.e., premise variation) leads to different evaluative results for the conclusion in linked versus convergent argument structures. Based on the evaluative result, the analyst can then determine whether the argument instantiates a linked or convergent structure.

Walton (1996, pp. 199f.) summarizes associated research on this approach into five tests (T1-T5; order modified), where a positive test result indicates a linked structure and a negative test result indicates a convergent structure. All these tests assume that an argument consists of two premises and a conclusion, an assumption we adopt throughout the paper. Consider T1 as an example, if the conclusion no longer receives any support when one premise of the argument is false, then the test result is positive, indicating a linked structure. Conversely, if the conclusion still receives some support when one premise is false, then the argument is convergent due to the negative test result.

T1 *Falsity/no support*

If one premise is false, then the conclusion no longer receives any support.

T2 *Falsity/insufficient support*

If one premise is false, then the conclusion receives insufficient support.

T3 *Suspension/no support*

If one premise is suspended (not proved, not known to be true), then the conclusion receives no support.

T4 *Suspension/insufficient support*

If one premise is suspended, then the conclusion receives insufficient support.

T5 *Degree of support*

If the joint strength of the argumentation is much greater than if each premise is considered separately, then the argument has a linked structure.

Tests T1-T4 are binary, determined by crossing the status of a premise (either falsified or suspended) with the resulting support for the conclusion (either insufficient or no support). T5, in contrast, evaluates the resulting support comparatively, assessing whether it is “much greater”. All these tests determine the argument structure by leveraging *argument strength variations* under premise variation, forming what we call the *strength-based* approach to the distinction problem.

Note that the pragma-dialectical approach (van Eemeren & Grootendorst, 1992; 2004) for distinguishing linked (coordinative) and convergent (multiple) arguments is incorporated into T4 (suspension/insufficient support test) by Walton (1996, p. 120). According to van Eemeren & Grootendorst (1992, p. 77; *italics added*), in a linked (coordinative) argument, the premises are all “necessary for a *conclusive* defense of the standpoint.” In contrast, each premise in a convergent (multiple) argument is “an independent and *conclusive*

defense of the standpoint” (*ibid.*, p. 78; *italics added*). Therefore, if a premise cannot sufficiently support the conclusion by itself, then the argument is linked; otherwise, it is convergent. The incorporation is also valid for Snoeck Henkemans’ (2001, p. 121f.) research, where she also appeals to the *sufficiency* of convincing the opponent regarding the truthfulness of the standpoint to distinguish between the two structures. Aligning with the suspension/insufficient support test (T4), the pragma-dialectical approach can thus be situated within the strength-based approach.

Before we introduce the problems that this approach may face (Sect. 3), we will now turn to the relevance-based approach to the distinction problem.

2.2 *The relevance-based approach*

The relevance-based approach solves the distinction problem by focusing on relevance, rather than argument strength. For instance, according to Freeman (2011), if “two or more premises are each *independently relevant* to the conclusion” (*ibid.*, p. 94; *italics added*), then the argument has a *convergent* structure. Conversely, in a *linked* argument, the premises involve a *relevance combination*, where each premise individually fails to be relevant to the conclusion unless taken together (*ibid.*, p. viii). Therefore, in Freeman’s view, linked premises are *individually irrelevant* to the conclusion, whereas convergent premises are *individually relevant*.

According to Walton (1996), T3 refers to the test adopted by Freeman (1988), suggesting that Freeman’s approach could also be categorized as strength-based. Freeman indeed compares linked and convergent arguments in terms of their strength. For instance, compared to the *relevance combination* of a linked argument, where each premise offers *no* support to the conclusion individually, a convergent argument is *modally combined*: “[E]ach premise may give some reason for the conclusion, whereas their combined weight [i.e., support to the conclusion] constitutes a stronger case” (*ibid.*, 2011, p. vii).

While the relevance-based approach can involve considerations of strength, it is not necessary. For instance, Freeman’s concept of relevance does not depend inherently on strength. Rather than following the common view that relevance is a binary relation between

two statements, Freeman (2011) treats relevance as a *ternary* relation between two statements and an inference rule connecting them (Freeman, 2011, p. 130). He defines this ternary relation of relevance as follows:

“A statement P is relevant to a statement Q if there is some inference rule in the canonical set C licensing the move from P to Q . Similarly, a set of statements $P_1, P_2[,] \dots, P_n$ is relevant to a statement Q if there is some n -premiss inference rule in C licensing the inferential move from $P_1, P_2[,] \dots, P_n$ to Q .” (Freeman, 2011, p. 131)

An inference rule can be deductive, inductive, or material (e.g., Toulmin’s warrants). For instance, given the inference rule “from x is born in Bermuda, infer that x is a British subject,” the statement “Harry was born in Bermuda” is relevant to “Harry is a British subject” (Freeman, 2011, pp. 131f). Freeman’s (2011) idea of ternary relation of relevance is inspired by Charles Peirce’s (1955, p. 130) notion of inference habit, which “convey[s] us from one judgment to another” (Freeman 2011, p. 130; also see Freeman, 1992). After all, in virtue of an inference habit, one can “perceive or intuit relevance” (*ibid.*, p. 130). Acknowledging that considering argument strength may simplify the explanation of Freeman’s approach, it is not inherent or central to Freeman’s concept of relevance—particularly given that a convergent premise can be false, it may fail to offer any support to the conclusion as a linked premise.

In this section, we introduce two approaches to the distinction problem. The strength-based approach relies on the support that the premises provide to the conclusion, whereas the relevance-based approach focuses on the relevance between the premises and the conclusion. Specifically, the strength-based approach presupposes that a linked premise offers (significantly) less support to the conclusion than a convergent premise, while the relevance-based approach presupposes that a linked premise is irrelevant and a convergent premise is relevant to the conclusion.

In the following section, we introduce the presupposition and inconsistency problems these approaches may face (Sect. 3.1), and explore their origins and possible solutions (Sect. 3.2), which motivate the development of the argument scheme-based approach (Sect. 4).

3. Problems, origins and solutions

3.1 *Two problems*

In this sub-section, we address the problems faced by the strength-based and relevance-based approaches. The strength-based approach encounters both the presupposition and inconsistency problems, whereas the relevance-based approach faces only the inconsistency problem.

The presupposition problem

As discussed previously, the strength-based approach presupposes that the support a linked premise offers to the conclusion is (significantly) less than that provided by a convergent premise. Specifically, this approach assumes that convergent premises *individually* offer *more* support to the conclusion than *any* premise in a linked argument. For instance, T3 (suspension/no support test) requires that linked premises individually offer *no* support to the conclusion, whereas a convergent premise should provide at least some support. After all, for T3 to be valid, it requires that “in a *linked* argument, if one premise is suspended, then the other premise offers *no* support to the conclusion” *and* that “in a *convergent* argument, if one premise is suspended, then the conclusion still receives at least *some* support from the other premise.”

However, the strength of a conclusion’s support is not only relevant to its argument structure, but also depends on the truthfulness of the premises—if the premises are unacceptable or even false, the conclusion will receive no support. Therefore, T3’s requirement that a convergent premise must provide at least some support to the conclusion presupposes that any convergent premise cannot be false. This presupposition is counterfactual and flawed, which constitutes what we term the *presupposition problem*.

If T3’s presupposition is indeed problematic, then T3 is unreliable for identifying whether an argument is linked or convergent. To see this, consider an argument that readers are likely to identify as *convergent*: “An air conditioner is *cheaper* than a fan; an air conditioner is *easier* to install; therefore, the air conditioner is better than a fan.” However, according to T3, this argument would be classified as

linked. After all, if either premise is suspended, the conclusion receives no support because both premises are false. This contradiction means to us that identifying an argument's structure should *not* require first evaluating the premises. Not only is this what we do not conduct in real analysis, but also, if the truthfulness of premises were crucial for determining the argument structure, then the argument structure could change if a premise's truthfulness changes. However, this change does not seem likely to occur.

As the presupposition regarding the truthfulness of premises is only relevant to the strength-based approach, the presupposition problem is unique to the strength-based approach. After all, the relevance-based approach does not require the premises to be true. In contrast, both approaches face the following inconsistency problem.

The inconsistency problem

The second main problem is the inconsistency problem, which is encountered by both strength-based and relevance-based approaches. The inconsistency problem manifests in two ways, referring to two types of inconsistencies: inconsistencies in identifying an argument's structure by testing different premises, and inconsistencies between the structures of different arguments that share one premise and the conclusion.

The first type of inconsistency refers to discrepancies in the argument structure identified when different premises of an argument are tested. All tests in the strength-based approach identify the argument structure by comparing the support offered by a single premise (under the condition that the other premise is assumed to be false or suspended) versus both premises together. As the single premise is chosen randomly, the choice of which premise to test can lead to different results, causing inconsistencies. Take T4 (suspension/insufficient support test) as an instance. Suppose one premise of an argument supports the conclusion sufficiently, while the other does not. If the first premise is suspended, then the conclusion cannot receive sufficient support, indicating a linked structure. In contrast, suspending the second premise still leaves sufficient support for the conclusion, indicating a convergent structure. Then, the argument *paradoxically* exhibits both linked and convergent structures.

We believe this type of inconsistency is evident. In contrast, the second type of inconsistency seems controversial. It arises when comparing two arguments that share one premise and the conclusion but are identified as different argument structures. Consider the following arguments:

A-1 An intuitively convergent argument (Freeman, 2011, p. viii)

[P1] His swimming suit is wet.

[P2] His hair is plastered down. Therefore

[C] He's been swimming.

A-2 An intuitively linked argument

[P1] His swimming suit is wet.

[P1-C] A wet swimming suit implies one has been swimming.
Therefore

[C] He's been swimming.

In Sect. 1, we cited argument A-1 and assessed that it has a controversial argument structure because both premises can work jointly *or* separately to support the conclusion. Compared with A-2, which intuitively presents a linked argument, however, A-1 would intuitively be perceived as convergent. That is, the *same* analyst would *simultaneously* judge A-1 as convergent, *and* A-2 as linked. However, we contend that this plain and intuitive judgment is inconsistent. Because both arguments include the same premise, P1, yet the treatments of it vary *inconsistently* depending on the argument's perceived structure. For instance, in van Eemeren & Grootendorst's (1992; See our Sect. 2.1) view, linked premises have to be taken together to constitute a conclusive defense, whereas a convergent premise can achieve this by itself. Therefore, identifying A-1 as convergent implies that P1 individually offers sufficient support for the conclusion C, whereas identifying A-2 as linked indicates that P1 *cannot* sufficiently support C individually. Therefore, the *same* analyst, while holding that P1 individually supports C sufficiently *and* insufficiently, commits inconsistency.

Readers may argue that P1 in A-2 cannot sufficiently support C because, to achieve this, it relies on another premise, P1-C, which happens to be the other premise.³ However, to be consistent, P1 in A-1 cannot either—it also requires P1-C. Although it might be expected that identifying the structure of A-1 would involve considering the implicitly presented premise P1-C, this *exactly* indicates that A1 *per se* cannot support C sufficiently. Therefore, supposing we do not revise the classification of A-1 as convergent and A-2 as linked, this inconsistency cannot be solved merely by introducing implicit premises. Instead, it requires adopting a different approach—one that, for instance, does not suggest that a convergent structure implies either premise can sufficiently support the conclusion.

To summarize, the presupposition problem involves the incorrect presupposition about the truthfulness (or acceptability) of premises, while the inconsistency problem involves discrepancies in identifying argument structures based on different premises or treating the same premise differently in two arguments. In the next sub-section, we will explore the origins of these problems and discuss potential solutions, paving the way for presenting our new approach in Sect. 4.

3.2 Origins and solutions of the problems

The origin and solution of the presupposition problem

The presupposition problem arises from integrating argument evaluation into the analysis of argument structure, conflicting with the consensus that argument evaluation should *follow* argument analysis. Since argument analysis is intended to serve the argument evaluation. Our basic premise thus is that the analysis of argument structure should be conducted independently of argument evaluation.

The presupposition problem can be solved in one of two ways: either by redefining argument structure as an evaluative concept, *or* by developing a method to identify argument structures *without* involving argument evaluation. Given the strong consensus in

³ Indeed, it should be noted that the sufficient support provided by P1 does not necessarily require the premise P1-C. For instance, adding “almost necessarily, P1-C” or “almost necessarily, P1-Q (a transitional proposition); and Q-C” can also establish this effect.

argumentation theory that the argument structure is an analytical concept, we adopt the latter choice by proposing an argument scheme-based approach to the distinction problem, utilizing the concept of argument scheme which is an analytical tool.

The origin and solution of the inconsistency problem

Now, we turn to the inconsistency problem. We will first explain that both approaches rely on the *capacity differences* between linked and convergent premises, then argue that such reliance leads to the inconsistency problem. *First*, as illustrated in Sect. 1, the distinction between linked and convergent arguments lies in whether premises work together or separately to support the conclusion. However, as Walton (1996, pp. 111f.; also see Yu & Zenker, 2022, p. 379) points out, premises work together in both convergent and linked structures.⁴ Virtually, the extant approaches have revised the criterion. They do not adopt the “working together or not” criterion, but rather the “*necessarily* working together or not” criterion: extant approaches assess whether premises *have to* work together to achieve the required effect of strength (in the strength-based approach) or relevance (in the relevance-based approach). For instance, T4 (suspension/insufficient support test) suggests that a *single* convergent premise *can* sufficiently support the conclusion, while linked premises *have to work together* to achieve this effect. Therefore, if premises do not need to work together to support the conclusion sufficiently, the argument is classified as convergent; if they do need to work together, the argument is classified as linked. Similarly, according to the relevance-based approach, an individual convergent premise is relevant to the conclusion, whereas linked premises *have to* work together to achieve this effect. This comparison between linked and convergent structures entails a capacity difference between linked and convergent premises: a convergent premise has a *stronger* capacity to achieve a particular effect compared to a linked

⁴ While the idea that premises work together to support a conclusion is a defining characteristic of an argument, some authors argue that the conductive argument serves as a counter-example, as it accommodates a counter-consideration as a premise. For a review of conductive arguments, refer to (Yu & Zenker, 2019).

premise. Otherwise, why linked premises must work together, while convergent premises need not?

After explaining the reliance on the *capacity differences* between linked and convergent premises, now we explain why such reliance leads to the inconsistency problem. *First*, inconsistencies in identifying an argument's structure occur if the two premises in an argument have different capacities—one meets the required effect while the other does not. For instance, suppose only one premise can sufficiently support the conclusion. Then, applying T4 (suspension/insufficient support test) *inconsistently* identifies the argument as linked *and* convergent. *Second*, inconsistencies arise between the structures of different arguments that share one premise and the conclusion if they are identified as distinct structures. As argued above, both approaches virtually rely on the capacity of individual premises. Given that the same premise should have the same capacity, treating it differently in two arguments leads to inconsistency. Specifically, given that a linked premise cannot meet the required effect, when it appears in a convergent argument, it can. (For instance, T4 (suspension/insufficient support test) requires that any linked premise cannot sufficiently support the conclusion, whereas any convergent premise can.) This results in inconsistent treatment of the same premise, as it can and cannot achieve the effect.

Let us discuss how to address the inconsistency problem. As argued above, relying on the *capacity differences* between linked and convergent premises results in the inconsistency problem. To avoid this, linked and convergent premises should *not* be characterized by differing capacity differences. Otherwise, it would imply that we could distinguish linked and convergent arguments based solely on this difference. To move the focus from (comparing) individual premise's capacity, our approach will focus on comparing linked and convergent *arguments* as wholes, instead of their *individual premises*. Moreover, the absence of capacity differences between linked and convergent premises suggests that we cannot rely on the “*necessarily* working together or not” criterion. After all, this criterion implies a capacity difference between linked and convergent premises. Otherwise, why must linked premises work together, while convergent premises do not? We are thus led back to the “working together or not” criterion, but with a clarification of what “working together

or separately” means—without denying that all premises work together to support the conclusion in a general sense.

In summary, the presupposition problem can be solved by abandoning strength-based considerations and reverting to the analytical nature of the argument structure. To resolve the inconsistency problem, comparisons should be made between entire *arguments*, rather than individual *premises*, and “necessarily” in the distinction criterion should be removed. We suggest that both problems can be addressed using the concept of argument scheme, which motivates our argument scheme-based approach, to which we now turn.

4. A new approach to the argument structure

4.1 *The argument scheme-based approach*

In this sub-section, we explore how the concept of argument schemes can be used to distinguish between linked and convergent argument structures. An argument scheme is an *analytical* concept that represents a common argument form found in natural language, embodying a substantial relation (van Eemeren et al., 2014; Walton et al., 2008; Yu & Zenker, 2020).

In the argument scheme-based approach to argument structure, we propose that the distinction criterion hinges on the *number* of argument schemes that an argument instantiates. A linked argument can instantiate *only* an argument scheme *once* (i.e., including only *one* instance of an argument scheme), while a convergent argument can instantiate an argument scheme more than once, or instantiate more than one argument scheme (i.e., including *multiple* instances of argument schemes, which may be the same *or* different types). In a linked argument, the premises work *together*, insofar as they are all part of the same argument scheme instance. In contrast, the convergent premises work *separately*, since they appear in different argument scheme instances, regardless of whether the argument schemes belong to the same type. According to this criterion, we define the linked and the convergent argument structures in the argument scheme-based approach as follows:

Definition of the linked structure in the argument scheme-based approach: An argument is linked if and only if it can instantiate only one argument scheme and can do so only once (i.e., it includes only a single instance of an argument scheme).

Definition of the convergent structure in the argument scheme-based approach: An argument is convergent if and only if it can instantiate multiple argument schemes or instantiate the same argument scheme more than once (i.e., it can include multiple instances of the same or different argument schemes).

Consider the case where two sign premises are presented in an argument. It might be tempting to consider that the argument could instantiate the argument scheme from sign either once or twice, depending on whether the two signs are aggregated into a stronger one. However, following our definition, an argument can only be considered linked if an argument scheme can be applied only once. Therefore, the argument including two sign premises will be identified as convergent because the argument scheme from sign *can* be applied twice.

The rationale behind this solution is as follows: we suggest that the decision to aggregate or not should (ultimately) be made during the evaluation stage, not during the analysis stage. This is because the support offered by different signs may require evaluation using different criteria. In such cases, the analyst might need to separate them again during the evaluation stage to ensure a fair assessment. For instance, consider justifying the conclusion “Nancy is a qualified mother” using two premises: “Her husband Mark says so” and “It has been empirically testified that highly educated women are more likely to be qualified mothers.” While combining the two signs might result in a stronger sign, during the evaluation stage, they may need to be isolated again. The weight of Mark’s evaluation depends, for instance, on how significant his perspective as a husband is in evaluating Nancy as a mother and the degree of emphasis in his statement. In contrast, the empirical evidence depends on factors such as the representativeness of the research and whether Nancy qualifies as a highly educated woman, as defined in the study. Since the

inference rules differ, combining these premises may be meaningless in the context of evaluation.

Furthermore, our approach to solving the distinction problem aligns with our intuitive understanding of argument structures. For instance, in the argument “Buffett is an expert in investing, he asserts that the Coca-Cola Company is worth investing in; therefore, the Coca-Cola Company is worth investing in,” the argument structure is *intuitively linked*. The argument scheme-based approach clarifies that the premises work together because they jointly instantiate one and only one argument scheme from expert opinion.

Let us apply the argument scheme-based approach to analyze the structures of A-1 and A-2 (shown again below). This analysis can demonstrate that our approach avoids the inconsistency problem, a problem that both extant approaches face (see our Sect. 3.1).

A-1 An intuitively convergent argument (Freeman, 2011, p. viii)

[R1] His swimming suit is wet.

[R2] His hair is plastered down. Therefore

[C] He’s been swimming.

A-2 An intuitively linked argument

[R1] His swimming suit is wet.

[R1-C] A wet swimming suit implies one has been swimming.

Therefore

[C] He’s been swimming.

Given that readers would identify A-1 as convergent and A-2 as linked, our approach generates the same outcome without committing inconsistency. According to our approach, A-2 is classified as linked because it instantiates only *one* argument scheme (argument scheme from sign) *once*, with “his swimming suit is wet” serving as a sign for the conclusion, and “a wet swimming suit implies one has been swimming” indicating this sign relation. They work together in the sense that both of them are in the same argument scheme instance. For A-1, it is identified as convergent because it *can* encompass *two* instances of the argument scheme from sign. Despite the presence of the same premise in both A-1 and A-2 (i.e., R1), our approach avoids the inconsistency problem. After all, our approach relies on counting

the number of argument schemes instantiated in an argument, rather than evaluating the capacities of individual premises. The judgments of R1 in both A-1 and A-2 are *consistent*, since ‘his swimming suit is wet’ (R1) is consistently treated as a sign of ‘he’s been swimming’ in both arguments, instantiating the argument scheme from sign.

To demonstrate the advantages of our approach, we will now more generally explain how it addresses and avoids the problems that extant approaches face.

4.2 Advantages

We suggest that both the presupposition problem and the inconsistency problem can be resolved by adopting the argument scheme-based approach. *First*, the presupposition problem is avoided because the argument scheme-based approach is purely analytical without involving argument evaluation. This means that the truthfulness (or acceptability) of the premises does not affect the identification of argument structures. Because regardless of whether the premises are true or false, it has no impact on the type or number of argument schemes instantiated. For instance, even if the second premise is false, it does not impact the classification of the argument “Warren Buffett is an expert in investing, who asserts that Coca-Cola is a *bad* company, therefore, it is bad” as an instance of the argument scheme from expert opinion. This separation of structure identification from evaluation restores the analytical nature of argument structure.

Second, our approach avoids the inconsistency problem by focusing on the argument as a whole rather than the capacity of *individual premises*. According to our definitions, an argument is classified as linked if it can only instantiate one argument scheme, and as convergent if it can instantiate multiple argument schemes. In a linked argument, both premises work together in the sense that they contribute to the same argument scheme instance. In contrast, in a convergent argument, premises work separately because they belong to different argument scheme instances.

All these descriptions are to describe the whole argument, rather than individual premises. Therefore, the inconsistency between identified structures by relying on different premises can be avoided. Additionally, it maintains consistency across different arguments with the same premise, as the treatment of the premise remains uniform.

For instance, insofar as whether the other premise is absent or not, a linked premise contributes to the same argument scheme instance.

Beyond addressing these two problems, our approach offers additional advantages. For instance, it is not constrained by the number of premises in an argument. Existing tests (T1-T5) often struggle with arguments involving more than two premises, which can significantly complicate their application by requiring complex calculation and comparison. This is possible because, for instance, an arguer may break down a compound premise into simpler ones, increasing the number of premises. For instance, the argument “Warren Buffett is an expert in investing; he asserts that Coca-Cola is a good company; therefore, the Coca-Cola is a good company” can be rephrased as “Warren Buffett is an expert; his expertise is investing; he once evaluated the Coca-Cola company; he asserted that it is a good company; therefore, the Coca-Cola is a good company.” Although the latter version includes four premises, it can be recognized as instantiating the argument scheme from expert opinion only once, as all components of the argument are included in this instance. This enables our approach to easily identify it as a linked argument, thus avoiding the need for complex strength calculations.

However, since our approach is based on the concept of argument scheme, it may be subject to challenges related to the argument scheme itself.⁵ In the next sub-section, we will explore potential problems it may face, and evaluate their significance.

4.3 *Difficulties*

To identify potential challenges our approach may face concerning argument scheme studies, we need to examine how it utilizes argument schemes in determining the argument structure. Given that the distinction between linked and convergent structures relies on the number of argument scheme instances within an argument, the approach becomes problematic if these instances cannot be identified. This issue may arise if the typology of argument schemes is insufficient to cover all argument types. However, current research on

⁵ We thank an anonymous reviewer for pointing this out.

argument schemes seems to provide a sufficiently comprehensive typology. For instance, Walton *et al.* (2008) provide a compendium that includes sixty-five types of argument schemes (*ibid.*, Chap. 9). There is no compelling evidence that an argument cannot be classified within this typology.

Moreover, due to the potential overlap between argument schemes, an analyst may need to decide which argument scheme type an argument instantiates. Additionally, given the varying interpretations of specific argument types, the analyst may need to determine whether the argument indeed instantiates that type. For instance, a *tu quoque* argument can also be identified as an *ad hominem* argument, just as a pragmatic argument can be viewed as an argument from consequence. Moreover, given the different understandings of a *tu quoque* argument, while Aikin (2008) sees it as relying on an inconsistency between words or between actions and words, Woods (2007) interprets the inconsistency as being between actions and words. Therefore, it is controversial whether an argument based on an inconsistency between words qualifies as a *tu quoque* argument. However, both cases arguably do not pose a significant issue for our approach. Since the analyst's choice in categorizing a borderline argument does not affect the number of argument scheme instances that can be included in the argument.

Therefore, while argument scheme studies may encounter some persistent challenges, these are unlikely to pose significant difficulties in the argument scheme-based approach to identifying argument structure. In the next section, we will discuss a key concern: does our argument scheme-based approach diminish the concept of argument structure?

5. Discussion: Do we diminish the concept of argument structure?

According to van Eemeren *et al.* (2014, p. 21), argument structure describes the *external* organization of an argument, while argument scheme pertains to its *internal* organization. This distinction suggests that both concepts operate on the same level. However, our argument scheme-based approach to argument structure places

argument schemes at a more fundamental level. Nonetheless, we will elucidate how our approach remains consistent with the distinction between external and internal organization. Indeed, our approach to some extent revitalizes the concept of argument structure.

We argue that the concept of argument structure has become largely descriptive and somewhat trivial. To illustrate this, consider how argument structure is often equated with argument diagram, which serves primarily as a presentational tool rather than an analytical one. Unlike an analytical tool, which is crucial for the process of analysis, a presentation tool merely *displays* the analysis results. Presentation tools, such as argument diagram, are useful for visualization and can facilitate argument analysis, but they are not essential. In other words, these tools help to display argument structures but do not tell analysts how to identify them. For instance, argument diagram can show what icon represents a premise or a conclusion and how to visually present linked or convergent structures, but it does not help an analyst determine the argument structure itself. This distinction is evident in the three argument structures illustrated in Fig. 1 in Sect. 1. While these figures act as argument diagram, demonstrating how to visually present different argument structures, they do not clarify how to distinguish between these structures. Thus, equating argument structure with argument diagram diminishes the theoretical significance of argument structure.

In contrast, if we are to treat argument structure as a meaningful analytical concept, there must be a reliable method for identifying different structures. Although some scholars have proposed theories of argument structure (e.g., Freeman, 1991; 2011; Snoeck Henkemans, 1992; 2000; 2001; Walton, 1996), as we have shown, these theories often extend beyond argument structure as an analytical concept by incorporating elements of argument evaluation, and may fail to address the distinction problem. While we admit that our approach may be seen as reducing argument structure to merely its relation with argument schemes, this is not problematic to us if our approach offers a manageable solution to the distinction problem.

We submit that our approach aligns with van Eemeren *et al.*'s (2014) view that argument structure describes the external organization of an argument. In our approach, in conjunction with argument schemes, argument structure describes the external organization by

indicating how many instances of argument schemes are included within an argument. The argument scheme itself, however, clarifies the substantial relation between the premise(s) and the conclusion.

6. Conclusion

In a previous study (Yu & Zenker, 2022), we classified extant research into strength-based and relevance-based approaches for identifying argument structures, specifically for distinguishing linked and convergent structures. Although that paper identified several problems with these approaches, it did not analyze the origins of these problems in-depth, or propose a manageable solution. The primary contribution of this paper is to address these gaps. For this purpose, we reviewed and thoroughly analyzed two main problems, uncovering their origins, and proposed the argument scheme-based approach.

We suggested that the *presupposition* problem arises from counter-factually presupposing the truthfulness (or acceptability) of the premises, which results from basing argument structure analysis on argument evaluation. This problem can be solved by restoring the argument structure as an analytical concept independent of argument evaluation. In contrast, the inconsistency problem arises from defining the distinction criterion based on the capacity difference between linked and convergent premises, rather than between the entire arguments. This issue fundamentally stems from incorporating “necessity” into the distinction criterion, which should be removed.

To solve both problems, we proposed an argument scheme-based approach. As the argument scheme is an analytical concept, this new approach does not rely on the argument evaluation to solve the distinction problem. Furthermore, our approach defines the distinction criterion based on the number of argument scheme instances that an argument can include. This clarifies the original distinction criterion without introducing “necessity”: In a linked argument, the premises work together, as they contribute to the same argument scheme instance; in a convergent argument, premises work separately because they belong to different argument scheme instances. We also argued that our approach is not limited by the unsolved

issues of argument scheme research, and does not undermine the theoretical value of argument structure.

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